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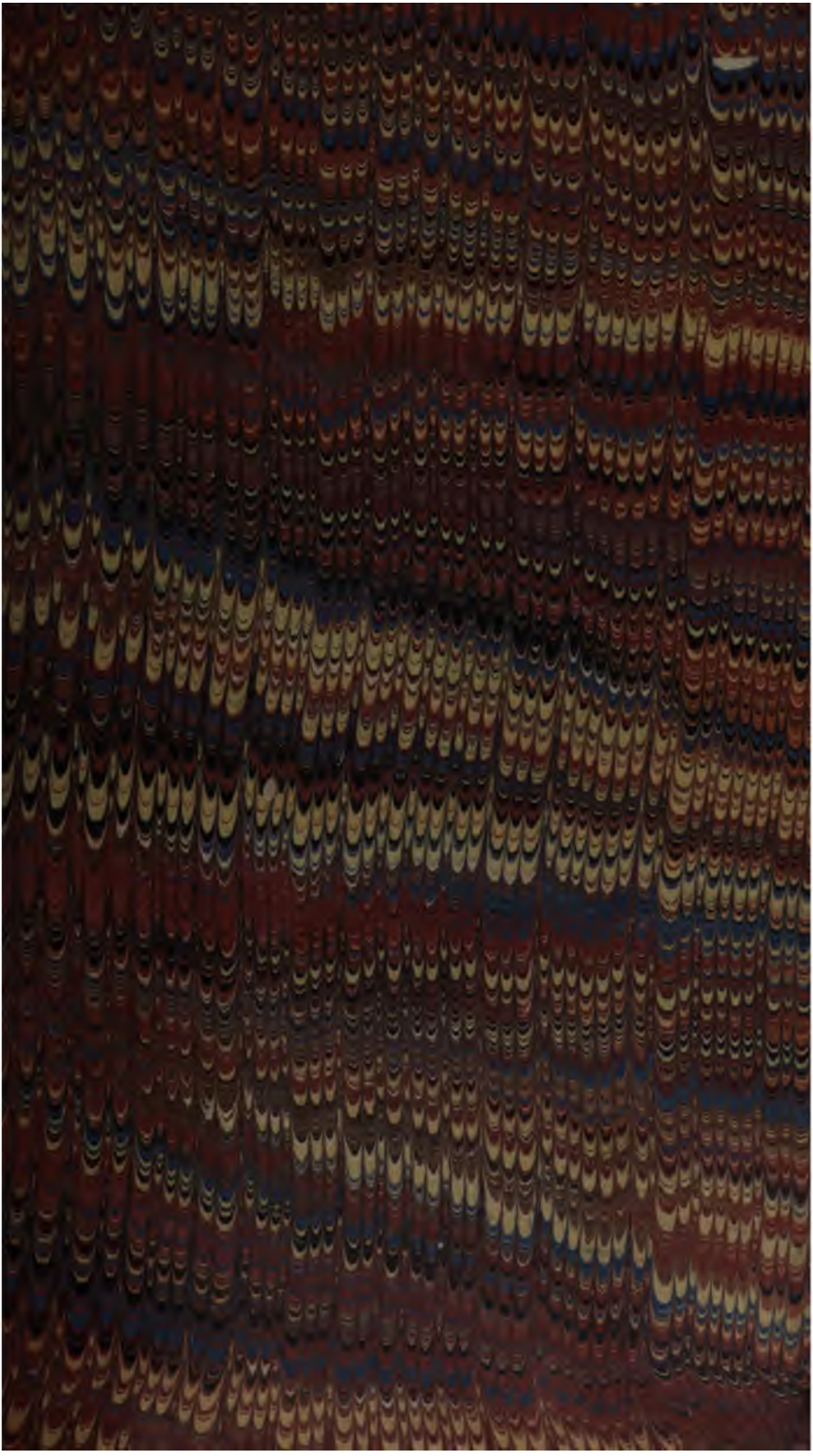

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OF

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JOURNAL

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## *A Catalogue of a Collection of Plants made chiefly in the Valleys of the Rocky Mountains or Northern Andes, towards the sources of the Columbia River, by* Mr. NATHANIEL B. WYETH, *and described by* T. NUTTALL.

Read February 18, 1834.

THIS collection was made wholly on the returning route of Mr. W. from the Falls of the Columbia to the first navigable waters of the Missouri; when pursuing the remainder of his route down the rapid current of the Missouri, scarcely any additional opportunity of adding to the fasciculus occurred. The number of the species and their interest to the botanist will therefore be duly appreciated, and particularly when it is known that this was the first essay of

the kind ever made by Mr. W.; and yet I can safely say, that besides their number, there being many duplicates, they are the finest specimens probably, that ever were brought from the distant and perilous regions of the west by any *American* collector.

## RANUNCULACEÆ.

1. CLEMATIS **Wyethii*. Lanulosa-pilosa, caule erecto simplici unifloro, florenutante, foliis sub-bipinnatisectis, pinnulis sub-trisectis, laciniis lanceolato-linearibus attenuatis rariter incisis acutiusculis.

Collected towards Flat-Head river, and in flower on the 25th of June.

4. The whole plant erect, fourteen to eighteen inches high, lanuginously pilose, the stem terminated by a single pedunculated nodding flower, of a deep brown color internally. In infertile shoots, the first pair of leaves appear to be entirely simple and oblong-ovate; the next leaves are pinnately directed: afterwards the subdivisions in the higher leaves are trifid or again pinnatifid, and here and there laciniated on the outer side; the segments are from half an inch to one inch and a half long, lanceolate-linear and somewhat pointed, attenuated above and below. The four sepals appear thick, oblong-lanceolate and nearly straight. Compared with Dr. Hooker's figure of C. *Douglasii*, it appears to be a distinct but closely

allied species. It no where presents those short linear multifid segments of that species.

2. ATRAGENE **Columbiana.* Pedunculis unifloris, foliis oppositis ternatim sectis, foliolis ovatis acutis, obsolete crenulatis, sepalis ovatis acuminatis, staminibus vix duplo longioribus.

*Hab.* Flat-Head river. In flower by the first of March, forming an intricate mat of branches so as to appear almost like a bush. Readily distinguishable from *A. verticillaris* by the flowers, which are scarcely half as large and of a dull palish blue. The leaflets are also cuneate rather than cordate at base, and the lateral ones apparently always entire.

3. THALICTRUM *dioicum.* Valleys of the Rocky Mountains at the sources of the Columbia.

4. ANEMONE (Pulsatilla) *Nuttalliana.* Head of Flat-Head river, in dry prairies. *A. patens,* Hooker, Flor. Boreal. Am.

5. RANUNCULUS *glaberrimus.* Hooker, Flor. Boreal. Amer. In the vicinity of Wallawalla river of the Columbia, and on Mr. Wyeth's route on either side of the Rocky Mountains, from the 20th of February to the 27th of May, in flower. A small, dwarf and smooth species, (probably) with a fasciculate or tuberous root, with a stem producing only one or two bright yellow flowers and two or three

sessile leaves; the first almost entirely simple, or three-lobed. The germs are, however, somewhat woolly or pubescent.

6. RANUNCULUS *cardiophyllus*. Hooker, Flor. Boreal. 1. p. 14.

*Hab.* In the Kamas Prairie, near the Flat-Head river. Flowering in June.

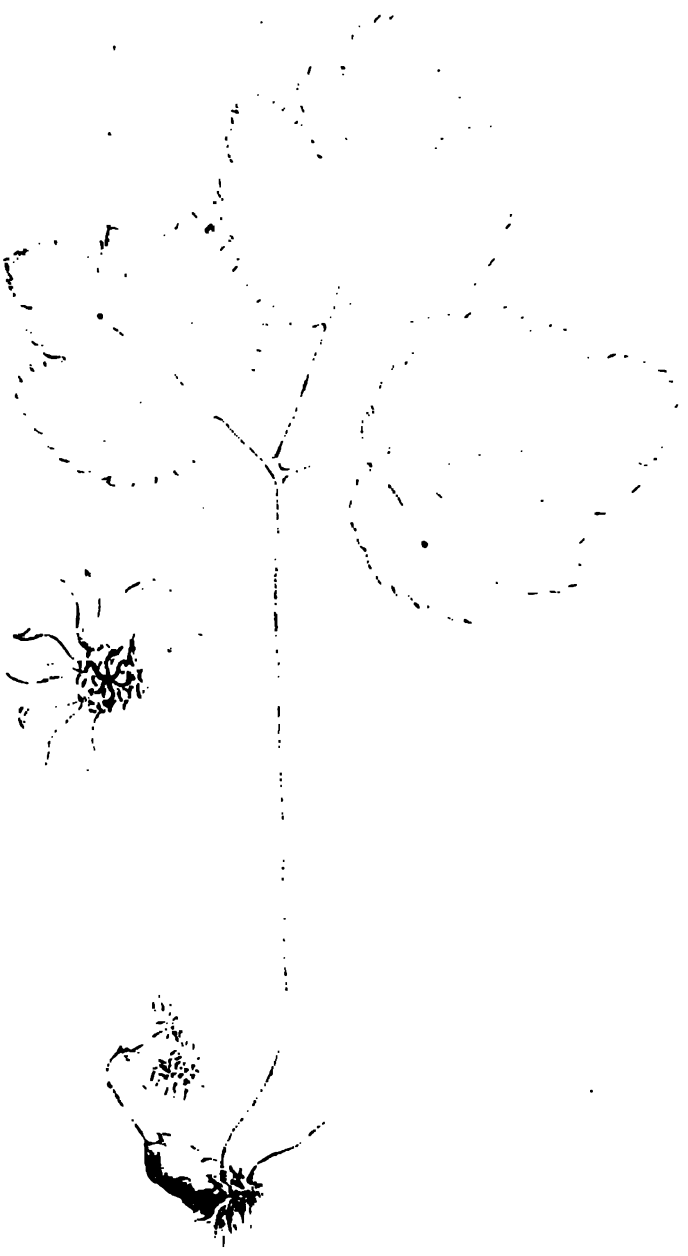
*CHRYSOCOPTIS.

Calyx, sub-12 sepalus, sepalis ligulatis, petaloideis deciduis? Petala 0, stamina 15—20. Capsulæ 8—10 stipitatæ? polyspermæ.

Herba perennis sempervirens, radice flava tinctoria; foliis trisectis subcoriaceis.

7. CHRYSOCOPTIS *occidentalis*. Plate 1.

Perennial, root repent? almost tuberous, and as well as the fibres, (in common with *Coptis*,) bright yellow. Leaves dark green and sempervirent, rather large, upon long peduncles, pseudo-trifoliate; the leaflets broad and roundish, partly cordate at the base, the lateral ones somewhat three-lobed and incisely toothed; the dentures sharply pointed; the central leaflet more distinctly three-lobed, often trifid; the central lobe also sometimes similarly divided. The bud of the scape oblong-ovate, conspicuous, the scales large oblong-oval and emarginate; being in fact abortive leaves composed principally of sheathing petioles. Flowering scape very short, about



CHRYSOCOPTIS OCCIDENTALIS.

three-flowered and nodding. Flowers very shortly pedicellate, not more than half an inch in diameter, bright yellow. Petaloid calyx spreading, composed of about 12 sepals, which are narrow, linear, long and acuminate; the inner ones (as far as I am able to examine the dried specimen) are some of them apparently partly clawed, but there are none of the hooded nectaries or petals of *Coptis*, which our plant however, wholly resembles in habit. Stamina about twenty, sometimes fewer; anther and filament adnate, the former whitish and oval. Pistils eight to ten, terminated by curved stigmas. I have not seen the fruit, and therefore can merely conjecture that it may prove stipitate.

*Obs.* The present plant, though perfectly distinct from COPTIS *trifolia*, is nearly allied to C. *asplenifolia*, but differs in the absence of the hooded petals. C. *asplenifolia* is not congeneric with C. *trifolia*; it has the attenuated ligulate petals of our plant, and in place of the very short petaloid stamens or *terminally* hooded petals, it presents concavities about the middle of the consimilar divisions of the perianth; it may therefore probably be considered properly as a sub-genus of our *Chrysocoptis*, which we propose to call PTEROPHYLLUM.

8. AQUILEGIA **leptocera*. Calcaribus rectis longissimis gracilibus; sepalis acutis maximis, staminibus stylisque

multo longioribus; caule paucifloro, laciniis foliorum cuneatis trifidis incisis.

Perennial. Stem about a foot high, sparingly branched, branches one to three-flowered, smooth, except the peduncles. Leaves from the root upon long petioles, ternately divided, smooth, somewhat glaucous beneath, segments cuneate, three-cleft, with a few external shallow incisions, branch leaves deeply trifid or entire. Flowers large and ochroleucous. Spurs somewhat longer than the expanded sepals, and pubescent; the sepals ovate and somewhat acute. Petals shorter than the calyx, very obtuse. Stamens numerous. Styles five to seven. This species is very nearly allied to the *A. cærulea* of Torrey, differing principally in the leaf and stem; and the flower is not blue.

*Hab.* In the valleys of the Rocky Mountains, towards the southern sources of the Columbia. Flowering in June.

9. Delphinium **bicolor*. Villosiusculum, pumilum, paucifloram; foliis digitatis 5-partitis, lobis 3-5-fidis, laciniis linearibus, brevibus, obtusi usculis, bracteis indivisis, petalis calyce brevioribus, inferioribus pilosis, calcare curvo longitudine calycis.

4. Stem simple, scarcely exceeding a span in height, terminating in a straggling raceme of five to seven large flowers on long peduncles. Leaves about three, near the base of the stem, the petioles of the lower ones somewhat dilated, upper leaves nearly

sessile, all with a short, digitate outline, the lower partitions divaricate, the segments short, linear and somewhat obtuse, slightly pubescent, particularly at the edges; upper leaves more simple, and finally forming bracts of a single segment. Sepals large, bright ultramarine blue, oblong-ovate; divisions of the lower petal roundish-oval, bearded internally; the two upper petals yellow, elegantly veined with blue, oval and somewhat crenate. The spur of variable length, but usually as long as the calyx, and curved down at the extremity. Capsules three, smooth.

*Hab.* On dry hills, near Flat-Head or Sailish river, towards the south sources of the Columbia. Flowering in the latter end of April, (2:th, Mr. Wyeth.) A very elegant and ornamental species.

## ANONACEÆ.

10. ASIMINA *triloba*, (Papaw.) On the banks of the Missouri, below the river Platte, with the commencement of the alluvial forest.

## BERBERIDEÆ.

11. MAHONIA *aquifolium*. Spiny indentions along the margin of the leaf, from thirteen to nineteen or twenty! A variable character. According to Decandolle, six to nine on either side the leaf.

## CRUCIFERÆ.

12. NASTURTIUM *pumilum. Simplex, foliis inferioribus, pinnatisectis oblongis obtusis, superioribus linearibus integris.

4. Stems unbranched, three to four inches high, (in twelve or more specimens,) leaves narrow oblong, pinnatifid, nearly to the midrib, below attenuated into a petiole, terminal segment rounded and obtuse, uppermost linear and undivided. Flowers yellow, rather large, the petals considerably exceeding the calyx in length. The pod long and narrow, the peduncle much shorter.

*Hab.* In dry situations towards the sources of the river Missouri.

13. NASTURTIUM *linifolium. Gracile, simplex; foliis linearibus integris, inferioribus sublaciniato-sectis; floribus majoribus.

4. Stems simple, eight to twelve inches high, leaves nearly all narrow linear and undivided, the axils often leafy. Petals yellow, nearly twice the length of the calyx. Pod narrow linear. Nearly allied to the preceding.

*Hab.* Head of Salmon river, Columbia, in dry soil. Flowering the last of May.

14. STREPTANTHUS *sagittatus. Foliis sagittatis, acutis, amplexicaulibus integerrimis, petalis oblongo-ovalibus, immaculatis.

Annual. Smooth. The stem branched above.

Leaves smooth, and apparently somewhat glaucous beneath; radical leaves oblong, the rest amplexicaule, sagittate, oblong and acute. Flowers apparently lilac-red, which color, though paler, prevails on the membranous margins of the sepals which are oblong and obtuse. Petals immaculate, cuneate-oblong and entire, with the claws very long and exserted as well as channelled, and somewhat tortuous; the raceme long and many-flowered; peduncles about half an inch long. Anthers long and linear. The pod narrow and elongated.

*Hab.* On the banks of Little Goddin river towards the sources of the Columbia. Flowering in June.

Turritis *patula* of Hooker, by its purple rose-colored flowers appears to be in all probability another species of this genus.

15. Thlaspi *cochleariforme*, De Candolle.

4. The whole plant perfectly smooth and somewhat glaucous. Radical leaves roundish-oval, upon long petioles, sometimes denticulated, stem leaves five or six, elliptic-oblong, very obtuse, amplexicaule, auriculate, the lobes obtuse. Raceme one to two inches long; peduncles rather long. Flowers pale sulphur-yellow. Petals cuneate-oblong. Stamens without dentures. Capsules with few seeds.

*Hab.* On the borders of a creek on Flat-Head river. Flowering towards the close of April.

## CAPPARIDEÆ.

16. Peritoma **integrifolia.* Foliis? crebris simplicibus lineari-sublanceolatis angustis, acutisimis basi attenuatis integris, calyce integra apice quadrifida.

⊙. Leaves (in all the three specimens, apparently branches in my possession) entire and simple, very much like those of the Toadflax, but shorter and equally crowded or sparse; whether all the leaves of the plant are so or not, I am unable to decide; the specimens appear to be branches by the presence of scattering pods on them. The whole plant is smooth; the stem thickly crowded with narrow flax-like leaves, the branches terminating in crowded flattish clusters of showy large red flowers. The petals lanceolate-oblong and unguiculate. Calyx wholly persistent, but marcesent, four-cleft, the divisions shortly acuminated. Stamens six, united with a ring which surrounds the base of the germal pedicel or stipe, the filaments capillary, and much exserted, anthers rather short, at length incurved. Stipe of the pod three-fourths of an inch long, the pod itself torulose but compressed, about two and a half inches long, terminated with a very small persistent style. Seeds many, attached to either end of the dissepiment, oval, even, fawn color, the germ strongly incurved, the cleft of the seed produced by the curvature wholly naked. The largest specimen is eleven inches long, yet in this and two others there are no appearance of compound leaves.

*Hab.* Towards the southern sources of the Missouri. Flowering from July to August.

From the habit of the following species, I think it not improbable that the lower part of the plant may have compound leaves.

17. PERITOMA **aurea.* Foliis 5-foliolatis, superioribus 3-foliatis, glabris, oblongis, obtusis, bracteis oblongis apiculatis, flore aureo, siliquis oblongis, staminibus æqualibus.

⊙. Herbaceous, branched, smooth, two feet high or more. Leaves petiolate entire, below in five's, above in three's. Raceme elongated and interposed, as in the preceding species, by a crowded continuation of short, oblong curved bracts. Peduncles rather short. The pod linear-oblong and obtuse, with a short stipe. Petals golden yellow, oblong-ovate. Stamina six, all of the same length. Calyx persistent, briefly four-cleft, not separating from its insertion.

*Hab.* With the preceding.

This species is very closely allied to the CLEOME *lutea* of Hooker, but differs in having much larger leaves and pods, which are blunt at the tips, and with the stamens equal.

## VIOLARIÆ.

18. VIOLA *debilis*. *Hab.* Flat-Head river. Flowering about the beginning of April.

19. VIOLA *Nuttallii*. *Hab.* Kansas Prairie, near the sources of the Columbia. April.

## CARYOPHYLLEÆ.

20. CERASTIUM *elongatum*. Sources of Missouri, Columbia, and the banks of the Arkansas. The round capsule exhibits a very close affinity to Arenaria. It is wholly covered by a soft pubescence, the leaves oblong-ovate, but the leafy axils produce often numerous nearly linear leaves.

## LINEÆ.

21. LINUM *perenne*. Sources of the Columbia.

## MALRACEÆ.

22. NUTTALLIA *Munroana*. Foliis subcordatis, inciso-dentatis, superioribus subtrifidis, pubescentibus, floribus fasciculatis, subspicatis, bracteis calycinis obsoletis deciduis. *Malva Munroana*, Hooker.

4. Stems about a span high, with a few slender axillary flower branches, and as well as the leaves covered moderately with stellated hairs. Leaves upon long and slender petioles, the lower somewhat cordate, the upper somewhat cuneate at the base, partly trifid and incisely toothed, the lower irregularly dentate and obtuse. Peduncles slender, axillary, commencing almost from the root, each terminated by a cluster of three to five shortly pedicellate flowers, the upper clusters accumulating into a short

and rather dense spike. Two or three very slender brownish, sphacelous, deciduous and filiform bracts beneath the calyx, which latter is briefly and bluntly five-cleft at the summit, and densely covered with stellated hairs. Corolla scarlet, about the color of minium or red lead. Pistils about eight to ten. A very beautiful and ornamental plant nearly allied to MALVA *coccinea*, of which it possesses wholly the habit.

*Hab.* The open vallies about the south sources of the Columbia. Flowering about the middle of June.

## ACERINÆ.

23. ACER *circinatum*, Pursh. A. *glabrum*, Torrey, Annals Lyc. New York, vol. ii. p. 172. The wood is essentially like that of the red maple, and presents a beautiful curled texture.

## LEGUMINOSÆ.

24. OXYTROPIS **lagopus*. Subacaulis, sericeo-lanuginosa, pumila, foliolis oblongo-ellipticis sub-4-jugis, capitulo subumbellato, calyce canescente, dense lanuginosa, bracteis ovatis longiore, germinibus glabris.

$\frac{1}{4}$. Root large and stout, dividing into several crowns of leaves above. Stipules membranaceous, intensely woolly. Leaves small, about three or four pair, elliptic-ovate or oblong, canescently woolly and shining. Radical peduncle scarcely exceeding the short leaves, about two inches long. The flowers in

a flat capitulum, five or six in number, violet blue, the corolla but little exserted. The calyx very woolly, tubular, the dentures short and linear. Vexillum oblong and emarginate. Carina shortly and bluntly acuminate, germ, and probably the pod, smooth.

*Hab.* About the sources of the Missouri.

25. OXYTROPIS *uralensis*, Lin. ASTRALAGUS *mollissimus?* Torrey.

26. ASTRAGALUS **leptophyllus*. Erectus glaber, foliolis linearibus remotis, racemis oblongis, brevibus, pedunculatis, folio longioribus, leguminibus subulatis? glabris, floribus ochroleucis.

4. Very smooth, the stem rather robust; stipules very small and wide, subovate, obtuse, adhering to the stem. Leaflets distant, about three or four pair, smooth, linear and obtuse. Peduncles very long, four inches or so before commencing with flowers. The flowers about ten, (apparently ochroleucous,) disposed in a short, lax, oblong raceme; calyx almost smooth, the dentures small and shallow. Flower rather small, but twice the size of that of A. *gracilis;* a species to which, as well as to A. *subulatus*, the present bears no inconsiderable affinity. Germ subulate, smooth, with apparently a villous stipe.

*Hab.* The head waters of the Missouri. Flowering about the middle of June.

27. ASTRAGALUS **Mortoni*. Glabriuscula erecta, foliolis 6-8-jugis oblongis obtusis, racemis densifloris nutantibus, pedunculatis, folio subæqualibus, germinibus villosis.

4. Erect and nearly smooth. Stipules membranaceous, broad, sheathing and attached to the stem. Leaflets six to eight pair, oblong, or oblong-elliptic. Raceme pedunculate, about the length of the leaves; flowers crowded, nutant, ochroleucous, the spike two to three inches in length. Calyx nearly smooth, the dentures short and acute. Flower not much expanded. Germ villous, not stipitate.

*Hab.* About the sources and upper branches of the Missouri, named in honor of Doctor Morton, so well known for his researches in the geology of the United States.

28. HEDYSARUM *boreale*, H. *Mackenzii*, of Richardson, not the *H. Alpinum* of Michaux.

*Hab.* The sources of the Missouri. Flowering in July. Flowers bright violet purple. The wings of the corolla very large, with the carina and stamens bent anteriorly at an obtuse angle in the usual conspicuous manner of the genus. The calyx small, with the segments subulate.

29. LUPINUS *sericeus*, Pursh. The bracts subulate and deciduous. Flowers blue. Leaflets sericeous, eight to ten. Root perennial. A very showy species.

*Hab.* Flat-Head river. Flowering in May.

30. LUPINUS *ornatus*, Douglas, in Hooker's Flora Boreal. Am. p. 164. A very showy species, nearly related to the preceding, and may probably be the L. *argenteus* of Pursh.

*Hab.* With the preceding, and flowering a little earlier.

## ROSACEÆ.

31. PURSHIA *tridentata*. A low spreading bush, common throughout the valleys of the Rocky Mountains. Branchlets covered with imbricated pointed scales, (persistent sphacelous stipules,) with the leaves apparently proliferous. The calyx of its pedicel covered with a short viscid pubescence.

32. SIEVERSIA *triflora*, GEUM *triflorum*, Ph. *Hab.* Flat-Head river. Flowering in May.

33. POTENTILLA *fruticosa*. From the head waters of the Missouri. Flowering about the 11th of July. The branches elongated, remote, one-flowered, the flower larger than usual, presenting a somewhat alpine habit.

34. POTENTILLA **rigida*. Pubescens, caule erecto, foliis 5-7 palmatisectis, lobis cuneato-oblongis, inciso-serratis subpinnatifidis, stipulis subintegris brevibus, floribus corymbosis approximatis, laciniis calycinis lanceolatis, petalis multo brevioribus, carpellis marginulatis lævibus.

Allied apparently to P. *chrysantha* of Treviranus; a native also of America and Siberia.

4. Very erect and rigid, the stem stout, and as well as the leaves, which appear wholly green, covered with a short pubescence. Leaflets attenuated at the base, the lowest in seven's, above in five's and three's. External sepals conspicuously smaller.

*Hab.* Towards the sources of the Missouri, and as far down as the old Arikaree village. Very nearly allied to P. *hirta*, particularly to the variety *recta*. The stipules, calyx, deep incisions of the leaves and the shortness of the pubescence, serve however, to distinguish it.

35. POTENTILLA *dissecta?* About a span high and erect: stipules large, lanceolate, and as well as the calyx somewhat tomentose. Uppermost leaves ternate, the radical ones pinnate, incisely serrate. Flowers in a lax corymbose panicle, large. Segments of the calyx linear-lanceolate and acute.

*Hab.* In the Kamas Prairie towards the sources of the Columbia. Flowering in June.

36. POTENTILLA *arguta*, Ph. Glabriuscula, graveolens, caule folioso erecto, foliis pinnatisectis subviscosis caulinis 3—5 foliolatis, foliolis oblongo-ovatis inciso-serratis, floribus corymbosis congestis, laciniis calycinis ovatis acutis, petalis ovalibus luteis longitudine calycis.

4. Stem robust, erect, 12 to 18 inches high, somewhat pubescent and viscid, in common with the whole plant. Lower leaves short and pinnately divided, almost sessile, all simply serrated, nearly

smooth and quite green, segments below about four pair, above only in five's and three's. Stipules short, dilated and somewhat toothed. Flowers crowded, small and yellow.

*Hab.* On the head waters of the Columbia, nearly allied to P. *agrimonoides*, or the BOOTIA *sylvestris* of Bigelow, but certainly distinct, in its greater viscidity, more leafy stem, and yellow instead of white flowers.

37. AMELANCHIER *alnifolia*. Source of the Missouri.

## ONAGRARIÆ.

### Subgenus of ŒNOTHERA.—*HETEROSTEMON.

Calyx, laciniis non coalitis, stigma globossum integrum. Stamina 4, cæteris breviora. Capsula sub-ovata lævi. Semina depressa punctata.

38. ŒNOTHERA **heterantha*. Acaulis, foliis oblongo-lanceolatis integris, petalis obovato-subrotundis retusis, stamina 4 breviora, capsulis lævibus.

♃. Stemless. Leaves almost exactly those of PRIMULA *lanceolata*, attenuated at either extremity, and apparently wholly entire and quite smooth. Tube of the calyx much shorter than the leaves, its terminal segments narrow lanceolate and reflected, as well as wholly divided down to the commencement of the tube, and not adhering laterally as in other species of the genus. Petals rather small, golden

yellow, not emarginate. Four of the stamens much shorter than the others, but little exserted beyond the claws of the petals. Capsules radical, sessile, brown when mature, ovate-elliptic and pointed, the valves quite even. Seeds pale, covered with impressed punctures, when seen through a lens.

*Hab.* Towards the sources of the Columbia, in dry prairies. Flowering in June. This plant probably constitutes a genus, being in the circumstance of its unequal stamens allied to *Clarckia.*

LOASEÆ.

39. BARTONIA *lævicaulis.* *Hab.* Towards the sources of the Missouri.

CRASSULACEÆ.

40. SEDUM *stenopetalum,* Ph. 4. About a span high. Producing often cæspitose tufts of root leaves, which are succulent, linear and rather acute, appearing also somewhat rough when dry. Stem leaves shorter, somewhat gibbous, and attached to the stem a little above their base. Branches often arise from the base of the stem; the corymb trichotomous and crowded with sessile flowers. Petals five, much longer than the calyx, linear-lanceolate and acuminate, saffron-yellow. Pistils five.

Order SPÆTALUMEÆ.

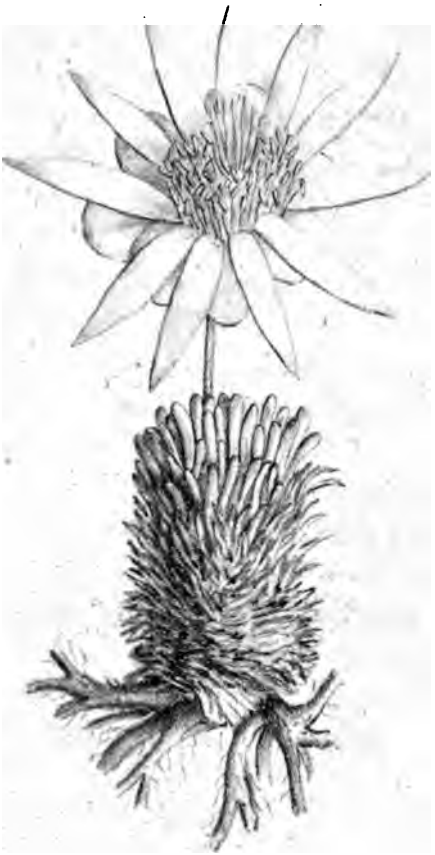
Calyx petaloideus, imbricatus, suboctosepalus. Petala 10—12, libera. Stamina numerosa, indefinita; anthera

utrinque *bifida!* Stylus filiformis, stigmata 6—8. Capsula supera, unilocularis, baccatus? 3—4 valvis? polyspenma.

Herba succulenta, perennis; folia integra. Scapo involucrato unifloro. Flores magni, *Cacti* facie.

41. LEWISIA *rediviva*, plate 2. Spœt'lum of the Sailish or Flat-Head Indians. *Racine d'Amare* of the Canadians.

4. Roots thick and stout, many united in the same general crown, the fibres few and short, issuing chiefly from the extreme roots. The epidermis of the root brown, internally madder red, the substance of the root almost like pith, pure white; when dead, on being moistened, it presents the appearance of starch, and in hot water dissolves into an edible and abundant mucilage. The leaves collected into rosulate clusters imbricated over each other; the older ones marcescent and persistent, the growing ones oblong linear, obtuse, thick and succulent; when dry quite membraneous and almost film-like at the base. Scape about two inches long, involucrate, and articulated above the middle; the involucrum consisting of six to eight rather minute filmy, narrow, long pointed leaves or scales. The flower very large, wholly like that of a *Cactus*, rose red. The calyx large, but somewhat shorter than the corolla, the sepals colored, quite petaloid, about eight, imbricated or incumbent, broad ovate. The petals about ten to twelve, cuneate-oblong, obtuse. Stamens numerous,



LEWISIA REDIVIVA.

filaments long and slender. Anthers linear, *bifid at either extremity*, the base divaricate or sagittate. Style 1, coalescing with the striated conic germ; the stigmas long and filiform, six to eight, somewhat pubescent. The germ *superior*, indicating the structure of a berry rather than of a capsule, the seeds oval, numerous. The ripe fruit unknown.

*Hab.* The dry prairies, in the vicinity of Lewis' and Flat-Head rivers. The roots constitute a favorite article of food among the aborigines. The bark is stripped off, and a handfull boiled with animal food forms a considerable quantity of nutritious mucilage. The dead root even almost dissolves into starch by maceration in cold water.

This very curious and showy plant constitutes a very distinct natural order, apparently almost intermediate between the *Ficoideæ* and *Cacteæ*, is but much nearer to the latter; yet from *Cactus* the habit is wholly different, the germ being also superior and perhaps capsular, though the seeds appear parietal and scattered as in a monolocular berry.

## GROSSULARIEÆ.

42. Ribes **reniforme.* Inerme, glabrum, viscosum, foliis reniformibus vix lobatis crenulatis, racemis plerisque trifloris, calycibus tubulatis, petalis inclusis brevissimis, bracteis spathulatis pedicello multo brevioribus, germinibus pubescentibus.

This species appears to be a small alpine shrub of

a depressed growth, remarkable for the viscidity of its foliage and the entireness of their outline, presenting scarcely any appearance of lobing. The flowers are greenish-white, and rather large in proportion.

*Hab.* Sources of the Columbia.

43. RIBES *aureum*, Ph. *Hab.* Little Goddin River, sources of the Columbia. RIBES *longiflorum*, Nuttall, in Fraser's Catalogue, 1813. So named *one* year previous to Pursh's publication.

## SAXIFRAGACEÆ.

### *LITHOFRAGMA.

Calyx cyathiformis 5-dentatus. Petala 5, unguiculata, trifida. Stamina 5—10. Styli 2—3, a basi distincti. Herbacea, folia reniformia.

44. TELLIMA (Lithofragma) *parviflora;* T. *parviflora*, Hooker, Flor. Boreal. Amer. l. c. Annual. Small and pubescent. Leaves reniform, almost twice three-lobed and cleft, divisions of the radical foliage broader, fewer and more obtuse, only about two leaves on the stem. Flowers in a short flattish cluster, pale rose, almost white. The petals conspicuously unguiculate and equally three-lobed. Stamens eight to ten. Capsule? This species appears wholly distinct in habit from the T. *grandiflora*, and approaches nearer to the genus Saxifraga. It ought, probably, with MITELLA *trifida*, to constitute a genus.

*Hab.* Dry hill sides on the borders of Flat-Head river. Flowering in April.

## UMBELLIFERÆ.

45. EULOPHUS **ambiguus*. Glaber, ramosus, foliis subbiternato-sectis, lobis angusto-linearibus, petiolis vaginantibus tumidis, umbellulis confertis, involucro utroque nullo, radicibus tuberosis, floribus flavis.

♃. Root consisting of small round edible tubers. Smooth. Stem about one foot high. Petioles dilated into large tumid sheaths, the leaves twice and partially thrice ternately divided, the segments smooth, one to one and a half inches long, narrow and entire. Umbels lateral and terminal. The flowers yellow, and destitute of both general and partial involucrum. Umbels hemispherical. Petals oval and inflected. Many of the flowers appear to be abortive.

*Hab.* On the borders of Flat-Head river. Flowering about the middle of April, or later. The root by Mr. Wyeth is said to consist of round and small tubers, having the taste of parsnips and is employed for food by the natives. Nearly allied to SESELI *leiocarpum* of Hooker, but the leaflets are not oblong. The stem somewhat branched, and the sheaths very tumid.

46. EULOPHUS **triternatus*. Puberulus, acaulis, foliis biternati-sectis, partitionibus mediis subdivisis, laciniis angusto-linearibus elongatis acutis, petiolis vaginantibus an-

gustioribus, umbellulis confertis, involucellis polyphyllis, exiguis, floribus flavis. Seseli *triternatum*? Pursh. 1. p. 197; Hooker, Flor. Boreal. 1. p. 264? pl. 94.

4. Very similar with the preceding, but stemless, minutely pubescent, with small sheaths and more simple and contracted umbels, the rays seven to ten. Involucrum none. Petals oval, inflected in the centre. Root fusiform.

*Hab.* With the preceding; the root also eaten by the Indians when fermented with heat.

### Cymopterus.

Calyx 5-dentatus. Petala obovata emarginata, apice inflexa. Fructus ovalis, á dorso subcompressus. Mericarpia 4–5–alata, alis latissimis undulatis, 2 marginales. Vittæ, numerosæ. Commissura nuda, 3-striata. Carpophorum plerisque bipartitum.

Herba pumila perennis, radice tuberosa. Caulis subnudus, brevissimus. Folia bipinnatisecta, lobis brevibus, involucro nullo s. parvo, involucello dimidiato. Flores polygami, albi aut flavi.

47. C. **glaucus*. Caule subnullo stipiformi. Foliis bipinnatisectis, segmentis subpinnatifidis, dentibus oblongiusculis apiculatis; pedunculis folio brevioribus, involucro involucellisque dimidiatis, floribus flavis.

4. Root large, descending. Stem or stipe above the root one and a half to two inches, usually clothed with large sheaths or stipules without leaves; from the summit of this stipe arise the leaves and flowers. Leaves smooth and glaucous, bipinnately divided,

the divisions about seven pair, becoming confluent towards the extremity, each segment oblong and incisely toothed or pinnatifidly cleft. Umbels three or four, all arising from the same common base with the leaves. Flowers yellow, the petals inflected at their tips. Involucellum and involucrum each composed of a very few narrow leaflets, situated on one side the umbellet. Styles two, very long. A distinct 5-toothed calyx.

*Hab.* On the borders of Flat-Head river, towards the sources of the Columbia. Flowering at the commencement of April. The ripe fruit I have not seen.

*Note.*—To this genus also belongs the THAPSIA *glomerata* of Missouri, and the SELINUM *terebinthinum* of Hooker's Flora Boreal. Amer. 1, p. 266, pl. 95.

## RUBIACEÆ.

48. GALIUM *septentrionale*. *Hab.* Head waters of the Columbia.

## VALERIANEÆ.

49. VALERIANA *sylvatica*. *Hab.* Between Lewis' and Green rivers, in the valleys of the Rocky Mountains. Flowering in July.

## COMPOSITÆ.

50. CREPIS **occidentalis*. Canescente-pubescens, pumila, foliis sessilibus, runcinato-pinnatisectis, laciniis linearibus acutis subdenticulatis, floribus paucis fastigiatis.

4. About a span high, covered with a close very short whitish pubescence. The leaves runcinate and acute, about two on the stem, greatly resembling those of the common Shepherd's purse; above, beneath the ultimate flowers, diminishing into simple undivided bracts. Flowers (in the only specimen before me) three, axillary and terminal, all attaining nearly the same height on the stem. Calyx slightly caliculate, the larger leaves of it disposed in a single series, the divisions linear and rather obtuse. Flowers bright yellow, rather large, about the size and appearance of those of APARGIA *autumnalis;* liguli five-toothed; the anthers simple, the style bifid, deeply and far exserted. Pappus pilose, somewhat scabrous through a lens, the hairs more than twenty, not dilated at base, or in any way distinguishable from those of Hieracium, nor are they at all stipitate. Seed smooth, brown. Probably, the HYMENONEMA *laciniatum* of Hooker, in Flor. Boreal. Amer. l. c.

*Hab.* Common on the borders and in the vicinity of the river Columbia.

51. HYMENOPAPPUS *Douglasii?* Differs from that species in having the flowers forming a loose corymb. Not more than a span high. The pappus very long, oblong-linear.

*Hab.* Near the sources of the Missouri.

4. About a span high, with the stem and leaves somewhat tomentose, the branches one-flowered, fas-

tigiate, so as to form a loose corymb, containing from about seven to ten flowers. Leaves pinnately divided, the lobes sinuately toothed, the dentures rounded. Pappus conspicuous, lacerated at the extremity.

*Hab.* Towards the sources of the Missouri.

52. Senecio *lugens*, Hook. Majusculus, foliis oblongo-lanceolatis crenulatis vix sparse lanulosis, caulinis parvulis amplexicaulibus longe acuminatis integris, panicula conferta multiflora; flores radiati.

4. A large species with the stem and leaves sparsely lanuginous. Stem simple. The lower leaves five inches or so long, the uppermost quite small, little more than an inch long, amplexicaule, quite attenuated to a long point, on the margins lanuginous at base. Flowers large and yellow. External calicle very small and indistinct.

*Hab.* Little Goddin river, towards the sources of the Columbia. Flowering in June.

53. Erigeron *glabellum*. Less smooth than ordinary, more robust, and with a few sharp scattering serrulations on the margins of the leaves. The flowers large as those of E. *bellidifolium*.

Erigeron **grandiflorum*. Glaberrimum, foliis ovato-lanceolatis acutissimis integerrimis, amplexicaulibus, margine scabris, caule paucifloro, (1—4) floribus maximis, radiis elongatis.

4. The whole plant remarkably smooth. Stem about one foot high, producing from one to four or

more large flowers, the leaves embracing the stem, but not quite round it, very acute, entire and very scabrous on the margin. Segments of the calyx linear and acute; rays bluish, twice as long as the calyx. Pappus double, the interior of scarcely more than fifteen rays!

*Hab.* Towards the sources of the Missouri.

54. ERIGERON *compositum*, Ph., not of Hooker or Richardson. Very hirsute, somewhat whitish with hairs. The leaves on long petioles, two inches or more, and triply trifid, the segments linear and obtuse. Stem one-flowered, about three and half inches high, having one or two simple segments arising from it. The flower rather large, the rays white or pale pink, segments of the calyx linear and acute. Rays of the pappus about fifteen.

4. This is a very different species from the plant of Hooker and Richardson. The leaves being greatly longer and more compounded.

*Hab.* In the Kamas prairie near Flat-Head river of the Columbia.

55. SOLIDAGO **Missouriensis*. Pumila, glabra, racemis erectis, foliis lineari-lanceolatis, acutis, inciso-subserrulatis, superioribus integris, panicula brevi laxa, floribus majusculis.

Stem slender, smooth, leafy, about a foot or so high. Leaves scabrous at the margin. Panicle about three inches long, the branchlets slender, the flowers pedi-

cellate, and brought together in a somewhat rhomboidal raceme. Rays as long as the calyx.

*Hab.* On the upper branches of the Missouri and in Arkansas.

56. CHRYSOPSIS **cæspitosa.* Glabra, pumila, multicaulis, caule a basi ramoso 1—4 floro scapiformi foliis rigidis, lineari-sublanceolatis acutis integerrimis, squamis calycinis ovalibus acutis margine scariosis.

4. Root and root-stock large, and divided into several dense crowns of leaves. The leaves quite smooth and rigid, with a very similar appearance to those of C. *graminifolia.* The stems very short, (about four inches,) wholly resembling scapes, one to three or even four-flowered, the peduncles very long, with two or three leaves scattered on the stem. Flowers bright yellow and rather large. Pappus scabrous, the external very minute.

*Hab.* Towards the sources of the Missouri and Columbia, in the valleys of the Rocky Mountains. Flowering in July.

57. CHRYSOPSIS **acaulis.* Cæspitosa, scabra, subacaulis, foliis confertis oblongo-lanceolatis subtrinerviis acutissimis, scapo subnudo unifloro, laciniis calycinis oblongo-lanceolatis acutis. Plate 3, fig. 1.

4. A small cæspitose plant with an alpine aspect, the leaves almost hoary, scabrous, entire, nerved, rigid and pungently acute. Scape mostly present-

ing a single minute leaf. Flower rather large and yellow. The pappus double. Seed villous.

*Hab.* In dry soil, Little Goddin river, towards the sources of the Columbia. Flowering in June.

58. Chrysopsis **alpina.* Subcæspitosa, multicaulis, microphylla, pumila, caule sublanato unifloro, foliis oblongis acutis scabriusculis subimbricato-approximatis, floribus pedunculatis violaceis, squamis calycinis acutis. Plate 3, fig. 2.

4. Root woody, branched, sending up clusters of unbranched stems from three to four inches high, thickly clad with small almost hoary and scabrous leaves, and terminating above in a peduncle about an inch or so high, terminated by a single large and elegant pale violet-purple flower. Scales of the calyx linear and acute. Pappus scabrous, just visibly double through a lens. Seeds villous.

*Hab.* In dry prairies, not far from Flat-Head river, within the valleys of the Rocky Mountains. Flowering early in June.

### Subgenus. Pappochroma.

Calyx subsquarrosus. Pappus crebris coloratus scabriusculus. Receptaculum nudum, s. squamulosum. Folia pinnatisecta.

59. Chrysopsis **coronopifolia.* ⊙. Glabriuscula, pumila, ramosa, foliis pinnatisectis, laciniis apiculatis, calycibus squarrosis.

CHRYSOPSIS ACAULE. *Fig 1.* C. ALPINA. *Fig 2.*

⊙. Stem rather decumbent and branched from the base, the branches one-flowered and softly pubescent. Leaves nearly smooth, simply pinnatifid, the leaf undivided to the rib which is broad and foliaceous, attenuated below, the segments and points apiculated. Calyx hemispherical, squarrose, the scales linear, and with spreading foliaceous tips. Rays obscurely bidentate (the color faded but apparently not yellow.) Pappus fulvous brown, copious and scabrous, the external wanting; receptacle naked, very slightly impressed.

*Hab.* Towards the sources of the Missouri. Flowering in July and August.

The STARKEA? *pinnata* or AMELLUS *spinulosus* of Pursh, forms a second species of this subgenus.

60. GRINDELIA *squarrosa*. On the upper branches of the Missouri. Flowering in the early part of August.

61. TRICHOPHYLLUM **multiflorum*. Multicaule, canescenti-tomentosum, foliis oppositis, inferioribus integris, superioribus apice trifidis sub-bifidisve, rameis integris linearibus; calyx octophyllus, laciniis ovato-oblongis obtusis.

⊙? About a span high, tomentose and lanuginous below. The stem divided into many simple branches from the root. Lower leaves oblong-linear, obtuse and entire, sometimes slightly three-lobed at the tip; upper leaves bifid and trifid, with occasional additional indentations, attenuated below into sheathing

petioles; uppermost leaves narrow and entire, closely tomentose and hoary. Peduncles three or more inches. Calyx cup-shaped, tomentose, of eight oblong-ovate tomentose leaves. Rays eight, oblong yellow, brownish below, slightly tridentate at tip. Teeth of the central florets minute. The styles not exserted. Pappus paleaceous, conspicuous, very irregularly torn at the extremities which are somewhat obtuse.

*Hab.* In the valleys of the Rocky Mountains, towards the sources of the Missouri. Flowering in July.

*Obs.* This plant has much of the habit of the *Picradenia* of Hooker, which last is apparently also a congener with the ACTINELLA *acaulis*.

62. ACHILLEA **lanulosa*. Sericeo-sparse lanata, foliis bipinnatisectis, partitionibus confertis, laciniis ultimis brevissimis acutis, rachi foliorum nudo, corymbo composito, floribus albis. A. *tomentosa*, Pursh, non Willd.

4. About one foot high, and presenting very much the aspect of A. *millefolium*. The leaves, and stem in particular, covered scatteringly with long silky hair, divisions of the leaves very minute and crowded; also more or less silky. Flowers white, very much like those of the common Milfoil.

63. RUDBECKIA *laciniata*. Sources of the Missouri.

64. Helianthus **uniflorus.* Glabriusculus, foliis plerisque alternis, oblongo-lanceolatis acutis scabris integerrimis, calyce folioso, caule unifloro.

4. Fourteen to sixteen inches high; the stem one-flowered, and as well as the leaves somewhat scabrous and slightly pubescent. The leaves alternate, sometimes opposite, partly three-nerved, oblong-lanceolate and acute as well as perfectly entire. Peduncle very long, terminating in one large and showy flower, of which the rays, fifteen to eighteen in number, are much longer than the squarrose leafy calyx. Leaves of the calyx, linear-lanceolate, acutish and pubescent. Pappus not very deciduous, consisting of two or sometimes three paleæ; the scales of the receptacle embracing the seed.

*Hab.* On the borders of the upper branches of the Columbia. Flowering in June.

ESPELETIA, Humb. and Bonpl.—BALSAMORHIZA, Hooker.

Calyx imbricatus, subsquarrosus, foliaceus. Corollulæ radii femineæ, vix dentatæ. Receptaculum planum paleaceum. Pappus nullus. Semina compressa planiascula, subquadrangulata.

Herba perennis, pumila, grandiflora, *Helianthi* facie; radix resinosa.

This genus has also been proposed by Dr. Hooker in his Flora Boreali-Americana, under the name of *Balsamorhiza*, for a species of *Heliopsis* there described.

65. Espeletia *amplexicaulis. Glabra, lucida, foliis radicalibus longissimis lanceolatis, caulinis amplexicaulibus subovato-lanceolatis acutis, caule subtrifloro.

4. Root large and deep. Radical leaf as long as the whole stem, entire, about twelve inches, by two inches wide. Stem leaves about three, amplexicaule, all veined conspicuously but not nerved or traversed by the leading vessels lengthways. Calyx foliaceous, and its segments as those of the receptacle very acute. Flowers large. Rays bright yellow, twelve to fourteen. Seed elliptic, compressed, perfectly naked, at length somewhat four-sided.

*Hab.* About Flat-Head river. In moist lands. The root, after heat and fermentation, by which process it becomes somewhat saccharine, is then eaten by the natives.

66. Espeletia *sagittata.* Tomentosa, incana, foliis radicalibus longe petiolatis cordato-hastatis integris acutis, caulinis paucis lineari-oblongis in petiolum attenuatis, caule subtrifloro pumilo, calicibus foliosis squarrosis, pl. 4. Buphthalmum *sagittatum*, Ph. 2, p. 564.

4. With a large yellowish root like a dock. Radical leaves about the length of the stem, seven or eight inches, softly and copiously tomentose, hoary. The stem also downy, resembling a scape, with about two or three small leaves like bracts on its upper part. Calyx very white and softly tomentose, leafy, the inner leaves linear-lanceolate and somewhat acute. Rays bright yellow, very large, from sixteen to

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ESPELETIA SAGITTATA.

eighteen, bidentate at the tips. Seed flattish, elliptic, very smooth, and wholly devoid of any vestige of pappus.

*Hab.* On the borders of Flat-Head river. Flowering in June.

The root of this plant also, when fermented a day or two in the ground, in a hole made for the purpose, and heated with hot stones, is then eaten and possesses an agreeable saccharine taste. The stems are never employed for food.

66. Espeletia **helianthoides.* Villosa, foliis radicalibus longissime petiolatis hastato-cordatis oblongis acutis, caulinis lanceolatis longe petiolatis, caule subunifloro, calycis foliolis parvulis lanceolatis acuminatis.

4. Very similar to the preceding species, but merely covered with a soft villous down, and with a small calyx very much like that of some species of *Helianthus*.

*Hab.* With the preceding, and equally employed by the natives for food.

## *Wyethia.

Calyx polyphyllus imbricatus subsquarrosus foliaceus. Radii fœminei. Receptaculum paleaceum planum. Pappus difformis, coronula brevissima paleacea pollyphylla, et seta solitaria laterali in florulæ disco. Semina compressa.

Herba perennis, pumila, *Helianthii* facie.

68. WYETHIA **Helianthoides.* Plate 5.

4. Root large and somewhat tap-shaped. Stem and calyx shortly pilose; the former not more than six inches high, terminated by one large sessile helianthoid flower. The leaves alternate, rather narrow lanceolate, entire, petiolate and acute, somewhat pubescent, several seated immediately under the flower. Calyx divisions numerous, lanceolate-linear, acute, and conspicuously ciliate. Rays large and long, oblong-lanceolate and bidentate, fourteen to sixteen, sulphur yellow. Seeds of the rays compressed, crowned by a very short pappus (in the germ;) in the infertile discal florets this is usually accompanied by a single slender conspicuous lateral awn.

*Hab.* In the valleys of the Rocky Mountains, near Flat-Head river, in rich plains. Flowering about the beginning of June. The root of this plant is, I believe, no less than those of the preceding genus, employed for food by the aborigines after fermentation and exposure to a parboiling heat.

## CAMPANULACEÆ.

69. CAMPANULA *rotundifolia.* *Hab.* Head waters of the Missouri.

## ERICINEÆ.

70. ARBUTUS *uva ursi.* *Hab.* In all the valleys of the Rocky Mountains, and westward to the shores

WYETHIA HELIANTHOIDES.

of the Columbia. Mixed with and used sometimes as a substitute for tobacco in smoking, by the aborigines generally.

## POLEMONIDEÆ.

71. POLEMONIUM *Mexicanum*. *Hab.* Flat-Head river. Flowering in May.

4. Partly pubescent. Leaflets somewhat rhomboidally oval and rather acute, numerous, (nine to twelve or more pair). Stem erect, the panicle somewhat crowded with flowers. The segments of the calyx oblong and somewhat acute.

72. PHLOX **cæspitosa*. Diffusa, procumbens, foliis subulatis ciliatis brevibus margine reflexis, floribus solitariis brevi pedicellatis, laciniis calycinis spinulosis, corollæ laciniis cuneatis integris. Plate 6, fig. 1.

4. With the general habit of P. *subulata*. Stem diffuse, cæspitose, procumbent, pubescent; axils leafy. The leaves short, linear-lanceolate, pungent at the point. Peduncles very short. The branchlets each terminated by only a single flower, which appears to have been pale violet or white.

*Hab.* Flat-Head river, on the sides of dry hills. Flowering about the 20th of April.

73. PHLOX **longifolia*. Subcæspitosa-multicaulis, foliis subulatis longissimis angustissimis glabris, cauliculi pauciflori brevissimi puberuli irregulariter trichotomi, pe-

dunculis filiformibus elongatis, laciniis calycinis acuminatis, corollæ laciniis oblongo-cuneatis integris.

4. The stems almost a span high, many from the same root, clothed below with the withered vestiges of former leaves. The leaves smooth, and narrow as threads, two and a half or so inches in length, those of the sterile branches extending nearly the length of the short and slender flower stems; peduncles very long and slender. Flowers apparently white. Allied to P. *Hoodii*, but very distinct.

*Hab.* In the valleys of the Rocky Mountains generally, flowering for the most part of the summer. The flowers apparently white.

74. PHLOX **muscoides*. Dense cæspitosa, minima, foliis arcte imbricatis oblongo-lanceolatis copiose ciliatis brevissimis, floribus sessilibus vix exsertis, corollæ laciniis cuneatis integris. Plate 6, fig. 2.

4. Root large and descending. The whole plant depressed to the appearance of a hoary *Bryum*, no part scarcely rising half an inch from the ground! Many of the leaves sphacelous, all hoary and densely imbricated into minute tufts, very lanuginous at the margins, the points acute. The calyx indistinguishable from the leaves, and not in the least elevated beyond their bosom. The flowers large and white, with a yellow spot towards the orifice of each. The segments of the corolla rounded, oblong and perfectly entire.

Fig 1 PHLOX CESPITOSA.

Fig 2 PHLOX MUSCOIDES

*Hab.* In alpine situations at the sources of the Missouri. Flowering in July.

75. CANTUA *aggregata*. *Hab.* Towards the sources of the Columbia.

## BORAGINEÆ.

76. PULMONARIA **oblongifolia*. Glabriuscula, caule simplici erecto, foliis lanceolato-oblongis obtusiusculis, superioribus acutis, floribus tubuloso-campanulatis paniculatis pedicellatis, calycibus abbreviatis, laciniis linearibus acutis ciliatis.

♃. Stem simple, smooth, six to eight inches high. Lower leaves commencing some distance above the base of the stem, linear-oblong, obtuse, attenuated into a petiole, the uppermost sessile, becoming oblong-lanceolate towards the extremity of the stem, and all more or less pubescent above. The panicle formed of axillary approximating clusters of flowers, each one distinctly pedicellate. The segments of the calyx narrow-linear and very acute. Corolla bright blue, and except in size, quite similar to that of P. *virginica;* the lobes obtuse, and the style somewhat exserted.

*Hab.* Towards the sources of Columbia river.

77. LITHOSPERMUM **pilosum*. Simplex, piloso-hirsutum, foliis linearibus acuminatis sessilibus approximatis, floribus fasciculatis sessilibus parvulis luteis, corollæ laciniis oblongis integris.

4. The stem simple and very coarsely hairy, particularly towards the summit. The lower part of the stem clothed rather thickly with alternating brown scales, which as the stem ascends, pass insensibly into the character of true leaves. The leaves almost hoary, very narrow and elongated towards the points, strigosely pubescent. The flowers yellow, similar to the other species of the section called *Batschia* by Michaux, clustered, sessile, and almost hidden among the leaves. The calyx very small, divided to its base, the divisions filiform, hairy.

*Hab.* Flat-Head river.

78. LITHOSPERMUM **Torreyi*. Strigoso-hispidum, foliis oblongo-linearibus obtusiusculis sparsis, caule pumilo ramoso, fasciculis terminalibus paucifloris, corollæ lobis oblongis integris. L. *decumbens*, Torrey, in Annals Lyceum, N. York, 2, p. 225, non BATSCHIA *decumbens*, Nuttall.

4. Stem about a span, not clothed with scales at the base, the foliage alike all over the stem, leaves less crowded than in the preceding species, the stem at length branched, and not near so hairy. Calyx segments subulate.

*Hab.* Flat-Head river. Flowering in June.

79. ROCHELIA **patens*. Strigoso-pilosa, foliis oblongo-linearibus obtusiusculis, caule simplici nudiusculo, ramis floriferis patentibus, floribus pedunculatis laxis.

4. Radical leaves long petiolate, linear-oblong,

those of the stem remote and sessile. Flowers in all respects almost similar to those of MYOSOTIS *scorpioides*. Flowers rather large, and apparently red; segments of the calyx small, linear and obtuse. Seed rugose.

*Hab.* Flat-Head river. Flowering in June.

80. ROCHELIA *glomerata*. *Hab.* In Flat-Head river prairies, in dry places.

## SOLANEÆ.

81. ANDROCERA *lobata*; NYCTERIUM, Donn. Missouri.

## RHINANTHACEÆ.

82. PENTSTEMON *erianthera*. *Hab.* Towards the sources of the Columbia. Flowering in June. A very showy species with purple flowers.

83. PENTSTEMON **micranthum*. Lævigatum, foliis linearì-lanceolatis acutis subamplexicaulibus integerrimis, floribus parvis glomeratis, interrupte spicato-paniculatis, corolla subtubulosa intus barbata, filamento sterili minuto vix barbato, calycis laciniis lanceolatis acutis.

4. Stem slender, smooth, twelve to fourteen inches high. The leaves narrow and smooth. Flowers purple, very small and aggregated into about three or four clusters, which look almost like so many whorls of a verticillated plant. The corolla tubular, somewhat curving, with an almost regular five-lobed border.

*Hab.* In the valleys of the Rocky Mountains, near the sources of the Columbia. Flowering in July.

84. PENTSTEMON **pumilum.* Puberulum, subcæspitosum, foliis lanceolato-linearibus acutis integris, caule brevissimo paucifloro, floribus majusculis glabris, filamento sterili superne barbato, calycis lacinis lanceolatis acuminatis.

4. Root large, the stem not more than three or four inches high; the whole plant more or less covered with a minute pubescence. Flower large.

*Hab.* On the borders of Little Goddin river, near the sources of the Columbia river. Flowering in June.

85. EUCHROMA **angustifolia.* 4. Pumila, pilosa; foliis divaricato-trifidis, radicalibus simplicibus, laciniis linearibus obtusiusculis; bracteis trifidis, segmenta intermedia subdivisa; calycis laciniis quadrifidis equalibus.

4. Many stems from the same root, about three to four inches high, and hairy. The leaves covered with a shorter pubescence, somewhat hoary, narrow, the segments divaricate, bifid, trifid and simple. The bracts usually trifid, with the central segment three-lobed, the color (apparently) lake red. Flowers small, scarcely longer than the even calyx.

*Hab.* In dry prairies, on the borders of Little Goddin river, near the sources of the Columbia waters. Flowering in June.

86. Euchroma *Bradburii. ♃. Pilosiuscula, foliis palmato-subbi-trifidis, laciniis linearibus, bracteis subbi-trifidis, calycis laciniis quadrifidis equalibus.

♃. Stem simple, five or six inches high. Leaves pubescent, cuneate, from the middle trifidly divaricate, the central segment trifid. The bracts (apparently) scarlet, shorter than the leaves, also trifid, with the central segment three-lobed.

*Hab.* With the preceding.

87. Collinsia *minima. Foliis oppositis cuneato-oblongis obtusis subdenticulatis, calyce laciniis corollæ subduplo breviore.

⊙. The whole plant from one and a half to two inches high, (at least in fifteen specimens now before me). Cotyledons round. Leaves oblong, or cuneate-oblong. Peduncle axillary, longer than the leaves. Flower considerably smaller than that of C. *verna*, but larger than in C. *parviflora*. The upper lip is white, the lower blue. Segments of the calyx narrow and short. It is very closely allied, however, to an Arkansas species, which I have named C. *purpurea* in my herbarium.

*Hab.* Flat-Head river. Flowering early in April.

88. Mimulus *rivularis?* Foliis ovalibus obtusis crenatis, caulinis sessilibus; floribus axillaribus terminalibusque, dentibus calycinis brevissimis.

♃. Stoloniferous; very smooth. Root leaves round

oval, sharply crenate, petiolate, stem leaves similar, sessile. Flower large, bright yellow.

*Hab.* In the valleys of the Rocky Mountains.

## LABIATÆ.

89. MONARDA *mollis*. *Hab.* Towards the sources of the Missouri.

90. STACHYS **pilosa*. Hirsute pilosa, foliis subsessilibus oblongo-ovatis acutis serratis, calycibus pilosimmis, dentibus elongatis, verticillis sub-6-floris.

♃. Rather low, robust and pubescent, the under surface of the leaves softish. The calyx very hairy. Flowers rather large, reddish.

*Hab.* In the valleys of the Rocky Mountains.

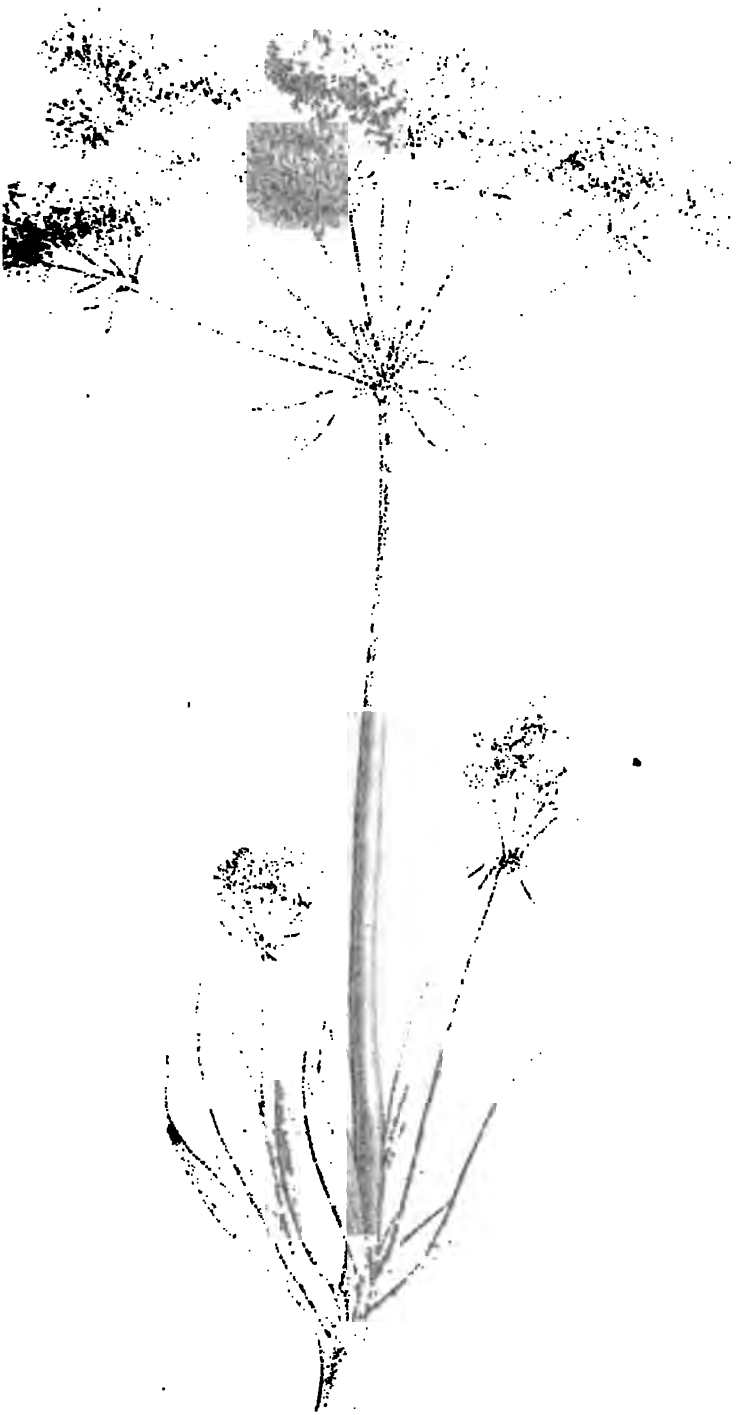
## PRIMULACEÆ.

91. DODECATHEON *meadia*; **puberula*. Leaves oblong, conspicuously petiolate. Umbel few-flowered, the calyx and peduncles pulverulently pubescent. The flower apparently deep blue, with a yellow ring at the base. The anthers also blue in the centre externally.

*Hab.* Near the borders of Flat-Head river. Flowering in April.

## POLYGONEÆ.

92. POLYGONUM *bistortoides*. Caule simplici monostachyo, foliis oblongo-lanceolatis petiolatis, bracteis subbidentatis acuminatis subtrifloris.



*ERIOGONUM HERACLEOIDES.*

4. About fourteen inches high, with one large and two or three smaller sessile leaves upon the stem. Spike cylindric-oblong. Divisions of the calyx cuneate-oblong, obtuse, apparently pale rose red.

*Hab.* In rich low lands of the Kamas Prairie, near Flat-Head river. Flowering in the middle of June.

93. RUMEX **paucifolius.* Floribus dioicis, caule simplici, foliis oblongo-lanceolatis obtusis basi attenuatis petiolatis, floribus paniculatis.

4. Stem about fourteen inches high, producing about three or four very unequal sized leaves, the largest about two inches long, by half an inch wide. The panicle branching and almost entirely similar with that of R. *acetosa*, three of the calyx leaves smaller, all of them oblong.

*Hab.* Near Flat-Head river, in moist places by streams. Flowering in June. The fertile flowers are not in the collection.

94. ERIOGONUM **Heracleoides.* Stoloniferum, maximum, foliis subverticillatis oblongo-lanceolatis, basi attenuatis, subtus tomentosis incanis, umbella magna supradecomposita, filamentis staminum pilosis, calycibus glabris. Plate 7.

4. A stout and remarkable species, sending out stolons from the root, bearing tufts of narrowish oblong-lanceolate leaves, rather acute, attenuated into stalks below, pubescent above, beneath white and to-

mentose. Umbel almost like that of *Heracleum*, with six to nine branches subtended by an involucrum of about eight leaves, lateral umbellets subdivided into three or four spokes, each umbellet furnished also with an involucellum of three or four leaves; the clusters, as usual, arising from so many woolly cups. Flowers yellow? calycine divisions cuneate obovate. Filaments of the stamina pilose. Styles three, long and filiform.

*Hab.* Sources of the Missouri. Flowering early in June.

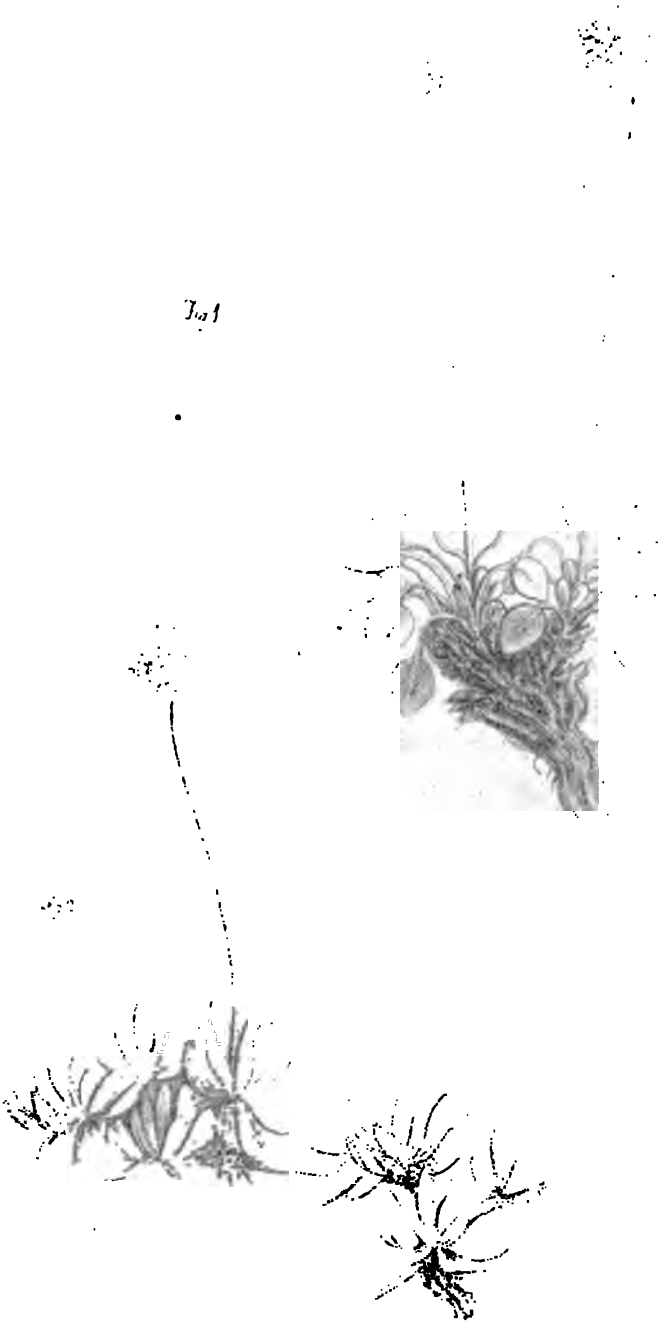
95. Eriogonum **ovalifolium.* Acaule, cœspitosum, incano-sericeum, foliis subrotundo-ovalibus longissime petiolatis, umbellula indivisa capitata, calycibus glabris, laciniis exterioribus brevioribus. Plate 8, fig. 1.

4. Root brown, tap-shaped, large and subdivided. Leaves and scapes white and tomentose. The leaves roundish-oval upon long petioles less than half an inch long. Scapes three to four inches long. The capitulum or simple umbel resembling a head of clover. The cups very woolly, and conglomerated into a single mass. Spokes or peduncles none. The calyx smooth, bright sulphur yellow, retuse oval and broad, the inner segments longer than the outer, oblong. Filaments smooth.

*Hab.* With the preceding.

96. Eriogonum **cæspitosum.* Acaule, incano-tomentosum, foliis parvulis cuneato-oblongis basi angustatis, um-

Tab 1



3. ERIOGONUM OVALIFOLIUM.

3a2. ERIOGONUM CESPITOSUM.

bellula indivisa capitata, involucellum cupulatum laciniatum, calycibus pubescentibus, filamentis lanatis. Plate 8, fig. 2.

4. The root covered with a brown bark, large, and divided above into numerous crowns of leaves, which become laterally entangled so as to produce a cæspitose appearance. The leaves less than half an inch long, lanuginous, as well as whitely tomentose below, above somewhat green, collected into rose-like clusters. Scapes tomentose, about two and a half inches high. The flowers sulphur yellow, somewhat pubescent externally along the centre of the segments; external divisions of the calyx cuneate-oval, internal very woolly, as well as the filaments. The styles three, exserted, capitate.

*Hab.* On the sides of the Rocky Mountains, towards the sources of the Columbia. Flowering from April to the middle of May.

## ELEAGNEÆ.

97. SHEPHERDIA *eleagnoides.* Also, a variety with *yellow* and larger berries, which are nearly sweet when ripe. Both kinds make a fine conserve, and are perfectly hardy in the climate of New England.

98. COMANDRA *umbellata.* Plains of the Columbia towards its sources. β. *lanceolata.* With the leaves lanceolate and acutish; the flowers larger. I have seen the same variety from Arctic America.

## URTICEÆ.

99. MACLURA *aurantiaca;* MORUS *tinctoria,* Sprengel, Torrey; certainly *not* of Linnæus! Of the true Fustic there are two distinct species in the herbarium of the late Sir J. Banks. That the fruit of this plant becomes succulent and pulpy is *well known* in Philadelphia and elsewhere, where it has been long cultivated. If not edible, which is probably the fact, it cannot of course be the luscious and *sweet* fruit described by Sloane, which fruit "stands on a foot-stalk, is as large as a nutmeg," composed of "*acini* like the other mulberries." It is surely unnecessary to say that this insignificant sized fruit is not the Osage orange, which fruit, the orange, it completely emulates in size, nor is it ever separable into acini! The resemblance with our plant is therefore wholly incompatible!

## CONIFERÆ.

100. THUJA **gigantea.* Strobilis laxis, squamis obovalibus retusis, foliis quadrifariam imbricatis, ovatis obtusiusculis arcte incumbentibus subæqualibus.

One of the most majestic trees west of the Rocky Mountains, attaining often the height of two hundred feet by thirty to thirty-seven feet in circumference. Its general appearance is a good deal similar to that of the common THUJA *accidentalis,* but the branches are erect and rounder, the leaves

almost all equal, not so compressed, and in profile not presenting their points. The cones are longer, looser and more clustered with scales which widen towards the point, which is slightly mucronated.

*Hab.* Near Flat-Head river and the valleys of the Columbia and the Rocky Mountains.

## MONOCOTYLEDONEÆ.

### LILIACEÆ.

101. CALOCHORTUS **luteus.* Caule dichotomo subbifloro, foliis setaceis brevibus, flore maximo, petalis interioribus multo majoribus dilatatis apiculatis glabris, basi maculato ciliato, signum in ungue petalorum tomentosum.

4. The root bulbous. The stem about a foot high, forked at the summit, bearing usually two or three flowers. Leaves remote, three or four, almost filiform, two or three inches long. Flower as large nearly as that of FRITILLARIA *meleagris*, apparently sulphur yellow, the three inner petals dilated, wedge-shaped and shortly pointed in the centre, with a purple spot just above the claw, the claw itself yellow with a foveolate depression containing an oval, elevated, tomentose mass. The length of the petal about one and a quarter inches, by three-fourths of an inch in width. The three inner petals are lanceolate, foliaceous, calycine, and shorter than the inner ones. Stamens short. Capsule linear-oblong, three-sided. Stigmas three, short and reflected. The capsule much like that of a Tulip.

*Hab.* Towards the sources of the Columbia. The roots of this and other species are eaten by the Indians. Mr. Douglass has discovered many more new species near St. Francisco, in California. Several of these have brilliant deep yellow flowers. In all, the petals alone afford permanent and peculiar marks of specific distinction, in none but the C. *elegans* are the inner petals wholly bearded as described in Pursh's generic character!

102. FRITILLARIA *pudica;* LILIUM *pudicum*, Ph. 1, p. 228. This species varies much in size, according to soil and situation. Pursh's figure represents a luxuriant specimen. It also varies in color from pale yellow to bright orange. The leaves are, on the stem, from two to four, the petals commonly cuneate-oblong. The *entire* stigma seems to indicate a different genus from either *Lilium* or *Fritillaria*, and the *obconic* form of the flower presents also a distinction. As a subgenus, I would therefore propose it by the name of **Eucrinum.*

*Hab.* On the borders of the Flat-Head river. Flowering in April and May. The FRITILLARIA *tulipifolia* of Caucasus, forms a second species of this genus or subgenus having however brown flowers, but the same entire stigma.

103. FRITILLARIA **atropurpurea.* Foliis sparsis linearibus acutis, caule subtrifloro, petalis lanceolatis basi discretis, stigmata revoluta longissima.

Bulb? Stem eight to twelve inches high, pretty thickly clothed with long, narrow, straight and scattered linear leaves. Flowers one to three, on shortish peduncles, brown and reticulated with whitish or greenish veins and spots, the petals narrow lanceolate, separated by narrow claws at their bases (in the manner of a Lily); the flower elegantly and divergingly companulate as in the FRITILLARIA *meleagris*, filaments a little shorter than the corolla, dilated at their bases. Germ oblong, the short style terminated by three very long revolute filiform stigmas.

*Hab.* With the preceding. Flowering early in June.

104. ERYTHRONIUM *grandiflorum*, Ph. 1, p. 230. Petals yellow, long-lanceolate, narrow and acute. Stigmas short, reflected. Scape one to two flowered. Leaves oblong-lanceolate.

## ASPHODELEÆ.

105. ALLIUM *angulosum*. Head waters of the Columbia. The white-flowered variety.

106. SCILLA *kamas*; genus *Kamassa*, Hooker. A large and showy species compared with the SCILLA *esculenta*, with the flowers somewhat ringent and of a deep and full blue. The leaves are lanceolate-linear, much shorter than the scape; the bractes rather long and subulate. The flowers upon

very short peduncles, the petals lanceolate-linear, three-nerved. The style long and filiform, slightly thicker towards the minute stigma.

*Hab.* In moist rich prairie pastures, in the valleys of the Rocky Mountains. Flowering in June, generally, and sometimes in such abundance as to give name to particular plains (*Kamas* prairie,) and communicate a general blue tint to many thousands of verdant acres. The root, which is wholesome to almost all palates, is collected by the aborigines in large quantities, and constitutes their greatest substitute for the *Cerealia* of civilized life. Culture is therefore wholly neglected in those countries which thus afford to the indolent natives a spontaneous supply of food. The roots are raised from the ground merely by prying with a pointed stake, they are eaten as a boiled vegetable, or mashed and pressed into cakes like bread; and so general has been this practice, that the Sailish (or Flat-Heads) have a distinct and radical word for *bread.* The SCILLA *esculenta* is also often eaten by the natives and whites who visit those distant regions of the west, but like the officinal squill, it produces an unpleasant effect, resembling in a slight degree the operation of ptyalism.

## MELANTHACEÆ.

107. ZIGADENUS *glaucus;* MELANTHIUM *glaucum,* Nutt. Gen. Am. 1, p. 232. Scape twelve to

fourteen inches high. Leaves remarkably glaucous, gramineous, acute, and a little shorter than the scape which contains about seven flowers; the flowers white, with greenish claws, marked at their base with obcordate spots, the petals oval. Styles three, filiform.

*Hab.* Towards the sources of the Missouri. Why this species should have been changed to the name of *Z. chloranthus*, by Richardson, I am at a loss to conceive, since the flower is decidedly more white than any other color. The northern plant is probably something different.

108. HELONIAS **paniculata*. Monoica, scapo inferne folioso paniculato, superne infra apicem fructifero, bracteis membranaceis acuminatis, petalis lanceolato-oblongis, staminibus exsertis, antheris aureis.

4. Root bulbous? Leaves lanceolate-linear and acute. The scape shortly branched below, the branches subtended by short membranaceous leaves. The flowers yellowish-white; below the summit of the panicle or raceme arise the fertile flowers upon long peduncles. Styles three, contiguous. Stamens exserted, the anthers bright yellow.

*Hab.* In the Kamas prairie, near Flat-Head river. Flowering in June.

## SMILACEÆ.

109. SMILACINA *stellata*. Little Goddin river, Columbia. Flowering in June. The leaves appear a little longer than usual.

*BRACHYPETALUM.

Petala brevissima, stellatim patentia, styli brevissimi. Herba caulescens foliosa, floribus paniculatis.

110. SMILACINA (B.) **amplexicaulis.* Foliis cordato-ovatis amplexicaulibus subacuminatis, floribus paniculatis, petalis staminibus paulo brevioribus.

2/. Stem about a foot high, and as well as the leaves covered with a short pubescence. Leaves three to three and a half inches long, by an inch and a half wide, broad ovate, shortly acuminated and amplexicaule. Panicle about four inches long, very similar to that of the S. *racemosa.* The flowers are, however, larger, as well as the petals, which are but little shorter than the stamens, and white. Style undivided, very short.

*Hab.* In the valleys of the Rocky Mountains, about the sources of the Columbia river. Flowering about the middle of June.

111. TRILLIUM *ovatum.* Very similar to T. *pictum,* but with the leaves sessile. The petals oblong-ovate, obtuse and considerably longer than the linear leaved calyx.

*Hab.* On the borders of Flat-Head river. Flowering the first of May.

IRIDEÆ.

112. IRIS *Missouriensis?* Imberbis, caule tereti foliis altiore subtrifloro, foliis angusto-ensiformibus, capsulis oblongo-linearibus, floribus bicoloribus.

4. Stem twelve to sixteen inches high, erect, filled with pith, producing about three flowers, of which the larger reflected petals are yellow, and the inner pale blue and narrow. Germ oblong-linear.

*Hab.* Towards the sources of the Missouri.

## LICHENES.

113. BORRERA *Columbiana.* Thallo cartilagineo cæspitoso sulphureo-flavo compressiusculo sublacunoso divaricato et vage ramoso, laciniis erectiusculis attenuatis gracilibus, scutellis parce aggregatis plerisque terminalibus, fuscis, margine reflexo crinito-radiato.

Found on the bark of Pine trees, near the river Walla-Walla, on the Columbia, remarkably conspicuous by its bright citron yellow color, conspicuous tufts and size, being as much as two inches high, apparently from the bark on which it is attached. The thallus is intricately and divaricately ramified, the divisions somewhat compressed and shallowly lacunose, their breadth at most about half a line, terminating in attenuated subulate forked divisions, some of the older specimens being more slenderly and intimately subdivided and pulverulent on their margins. The scutels orbicular, sessile, mostly occurring together by two or three, terminating the shorter restricted branches of a dark brown color, and irregularly hollow in the centre; the minute branchlets of the yellow thallus, growing out beyond the scutels produce the irregularly radiated and crinite appear-

ance of the margins of the fruit, almost as in the USNEA *florida*. The figure of LICHEN *vulpinus* in Flora Danica, t. 226, strongly resembles the thallus of our plant. With the present specimen occurred also portions of the ALECTORIA *jubata*.

*A Description of some of the rarer or little known plants indigenous to the United States, from the dried specimens in the herbarium of the Academy of Natural Sciences in Philadelphia.* By T. NUTTALL.

AMONG the rare plants of doubtful natural affinity may be mentioned the *Tripterella* of Michaux; a genus formed for the reception of a minute and very singular plant found indigenous to the extreme southern states, and unknown to the north of the central parts of South Carolina. The description of this plant given by Michaux is so far exact as to leave nothing particular to add to its history. Previous to this period Linnæus had mentioned another species which he referred to the genus *Burmannia*, a plant of India, by the name of B. *biflora*, which indication describes a depauperated specimen of the TRIPTIRELLA *cærulea*, of Elliott.

In a collection of plants made in East Florida, by my friend Mr. Ware, an imperfect specimen of something which I mistook for a *Lobelia* occurred; and in the account of that collection, published in Silliman's Journal of Science, it is given without a know-

ledge of the flower, by the name of LOBELIA *aphylla*. On obtaining sight of flowering specimens of this curious plant in the herbarium of the Academy of Natural Sciences of this place, I discovered that it constituted a new genus, related to *Tripterella*, and which, from the absence of the winged margins of the germ and corolla, I propose to call APTERIA. In this plant also the corolla is quite open, tubular-campanulate, the border six-toothed, with the alternate dentures smaller. The stamens are three, apparently springing from a slight constriction of the tube of the corolla near the summits of the three thickish capitate stigmas which terminate the rather long style. The capsule is naked, globular-ovate, one-celled, many-seeded, the seeds small, oblong-cylindric, and pitted with impressed punctures.

These two genera, so distinct from all other known vegetables, (at least to me,) constitute a natural order, which I propose to call TRIPTERELLEÆ, and which may perhaps eventually include the genus *Burmannia*, though of this I am so far doubtful as to leave it out of the prescription of the group.

In this small tribe there exists no calyx or spathe, the corolla is monopetalous, tubular or subcampanulate, coalescing with the sides of the germ, which is inferior, its lower portion often presenting three more or less salient membranous ridges, though in

*Apteria* they appear to be wholly absent; the border of the corolla is six-cleft, with the alternate dentures smaller. Stamina three, the filaments arising from the sides of the corolla tube contiguous to the stigmas, towards which they converge, and are included. The style one, with three wedge-shaped stigmas. The capsule globular or oval, presenting a structure of three cells, or only three parietal receptacles, without any valves, which spontaneously open, the seeds escaping by slight openings in the summit of the capsule, or the mere irregular rupture of its membranous sides. The seeds are very numerous, terete and somewhat curved, and seen through a lens they are covered with impressed punctures.

These are very small, annual? leafless plants, with simple or but little divided stems, clothed with a few alternate scales, the flowers, blue or purplish, are disposed in distichous few-flowered spikes, aggregated into heads, or even solitary and alternate in *Apteria*. The affinity of these plants to any other order is obscure or undefined. On one hand they appear to be allied to the *Bromeliaceæ*, and on the other even to the *Orchideæ;* the capsule and seeds of Apteria being those of an Orchis, while the anthers are those of the ordinary bicellular structure. My knowledge of the stamens, however, is very incomplete, as I have not seen them in the living plant.

## *Apteria.

Calyx 0. Corolla monopetala, aptera, tubuloso-campanulata, margine 6-dentato, dentibus alternis minoribus. Stamina 3. Capsula subglobosa infera, 1-locularis, evalvis. Receptacula parietalia 3. Semina minuta, numerosa, subteretia, nuda.

Herbula aphylla annua? radix fibrosus, flores sparsi.

1. Apteria *setacea*. Plate 9, fig. 1.

Annual? Stem usually simple, generally setaceous, sometimes terminating in a single flower, at other times the stem branches from near the very base, each branch bearing at remote distances two to four or five largish pedunculated flowers; the whole length of the stem four to six inches, clothed with a few remote and minute, ovate, sphacelous scales, which as well as the stem are usually of a purplish color. The germ appears to be immersed and coalescent with the tube of the corolla. The flower white, with six purple spots, and similar colored tips on the dentures of the border; the proper tube of the corolla about a line long, widening somewhat above; from its sides above, contiguous to the stigmas, spring out three stamens which I have not yet been able sufficiently to examine, from the thin and succulent nature of the flower, when in a dried state; above the included stamens the rest of the corolla, about a line more in length, is campanulate, with the border six-toothed, three of the dentures being verti-

Fig 1 CRISTATELLA EROSA.

Fig 2 APTERIA SETACEA

cally semiovate, and the three intermediate ones being narrow and ligulate. Style one, rather long, terminating in three conspicuous wedge-shaped short stigmas. The capsule globular, elliptic, smooth and even, marked with six main straight vessels (called improperly nerves), without any proper valves, bursting irregularly by desiccation at the membranous sides, and so scattering its seeds; it is also crowned by the marcescent corolla, and is imperfectly three-celled, presenting only three parietal concave receptacles for the seeds. The seeds are somewhat translucent, yellowish, curved, terete, attenuated a little at the two extremities, and when seen through a lens appear pitted with little hollow points. The sensible qualities of the plant are very slightly bitterish and considerably astringent. The same highly astringent and bitter taste (something like that of green tea) is very discernible in the TRIPTERELLA *cærulea.*

*Habitat* of the APTERIA. Found in the vicinity of St. Louis, Missouri, by Mr. L. C. Beck; in Alabama by Doctor Gates; and discovered in East Florida by Mr. Ware, probably on the margins of shallow grassy ponds, the situations mostly affected by the *Tripterellas.* In addition to the history of the habit of T. *cærulea,* I may add that luxuriant spikes of this very diminutive but elegant plant, present bifid branches with as many as ten and eleven flowers on the same stem; in this plant also the dehiscence

of the capsule is without any regularity, the seeds usually escaping through the sides of the valves which shrink into torn and irregular transverse fissures by drying.

2. HELENIUM *tenuifolium.* Foliis prælongis angustissimis linearibus, ramis unifloris, pappo longissime acuminato, aristato, caule pumilo nudo.

4. Scarcely a span high? smooth and rather crowded with very narrow and long leaves. The flowers upon longish and slender peduncles, bright yellow; the rays about eight, three-toothed; calyx formed of a simple series of slender leaves; receptacle naked, slightly convex. The seed villous, each crowned with six long acuminated chaffy pappus scales.

*Hab.* The states of Mississippi and Alabama.

3. CHRYSOPSIS *pilosa.* Molliter pilosa, annua, erecta, foliis lineari-oblongis acutis basi cuneatis subsessilibus, floribus paucis subfastigiatis pedunculatis, squamis calycinis linearibus acuminatis.

⊙. Flowers yellow, the rays about sixteen. Stem erect, about a span high, slightly branched; flowers upon long slender peduncles. The first leaves nearly smooth, the uppermost clothed and especially edged with very long soft hairs. Pappus brownish, distinctly scabrous, the extended white crown very conspicuous.

*Hab.* The grassy plains of the Arkansas, collected by myself, and since by Dr. Pitcher.

4. CHRYSOPSIS **hyssopifolia.* Glabra, foliis sparsis linearibus brevibus, calycibus subsquarrosis, laciniis inæqualibus, ramulis fastigiatis unifloris subcorymbosis, floribus luteis.

♃. About a span high, branched from near the base, quite smooth, or possessing only a few scattered hairs near the lower part of the stem. The leaves narrow linear, like Hyssop, scarcely an inch long. The flower branches corymbose; segments of the calyx narrow linear, acute, very unequal. The rays yellow. External pappus minute.

*Hab.* In West Florida, discovered and collected by Mr. Ware.

### *CHRYSOMA.

Calyx parvus sub-5-flosculosus, imbricatus, squamis decussatis obtuse carinatis. Radii ligulati-oblongi, 2. Pappus simplex, inæqualis, pilosus scaber. Receptaculum, nudum.

Frutex *Chrysocomæ* habitu et facie, sed flores biformes ut in *Solidago*.

5. CHRYSOMA *solidaginoides.* A smooth shrub considerably branched, the branches nearly terete and slender, producing compound panicles of yellow flowers made up of slender stalked fastigiate clusters. The calyx very small and colored yellow, as in most Chrysocomas; the scales of unequal length, closely

and decussately imbricated, and keeled as in the flowers of that genus; the pappus and small number of florets are also in accordance with the same genus. The leaves are linear-oblong, obtuse, entire and attenuated below. The tubular perfect florets are most generally three, the female ligulate ones never exceed two, the border linear-oblong and obscurely three-toothed at the tip. Although the condition of the florets in this plant appear artificially almost similar to those of *Solidago*, the real affinity of the plant and what it would be pronounced at a hasty glance, would be *Chrysocoma*, from which genus, in fact, it only materially differs by the presence of liguli.

*Hab.* West Florida, where it was collected several years ago by Mr. Ware.

6. Cynthia **lyrata*. Glaberrima, acaulis, foliis sublyratis oblongis acutis, scapo unifloro nudo, laciniis calycinis linearibus acutis.

♃. Very nearly related to C. *dandelion*, but with a fibrous root, and the leaves, which are glaucous, more or less inclined to produce divaricate laciniæ, which vary in number, and are sometimes very few. The flower orange yellow? exactly as in the species mentioned, but with the base of the calyx glabrous, and its divisions somewhat narrower. The pappus double and the hairs numerous.

The above new species was collected by my-

self and Doctor Pitcher, in the territory of Arkansas.

7. CYNTHIA **Griffithii.* Glaberrima, glauca, foliis radicalibus runcinato-lyratis oblongis, caulinis amplexicaulibus, caule paucifloro, (2—3,) floribus longe pedunculatis.

*Hab.* In the vicinity of Philadelphia, with the C. *amplexicaulis*, which it wholly resembles. Distinguished by Doctor Griffith. Blended up by Pursh who no doubt had seen it, in his description of C. *amplexicaulis*. It is smaller than that species; with the leaves more or less deeply runcinate-lyrate, the terminal and entire lobe being large and obtuse and almost rounded. The stem scapoid with one amplexicaule leaf, and two small nearly opposite ones beneath the umbel of three or more long pedunculated flowers. The external pappus is nearly obliterated! It is also smaller than its near relative with which we have now compared it. For the use of the specimen I am indebted to its discoverer, Doctor R. E. Griffith.

KRIGIA *dichotoma* proves to be nothing more than an autumnal state of K. *virginica!*

8. BORKHAUSIA **grandiflora.* Subacaulis, pilosiuscula, foliis runcinato-lyratis lobis incisis acutis s. integriusculis, caule brevissimo, pedunculis subsolitariis longissimis unifloris.

☉? A very large flowered and remarkable spe-

cies. The leaves like those of the Dandelion, but the lobes often divaricately laciniated or toothed, rather scabrous and a little pilose. The stem solitary, not more than one or two inches, sometimes producing two or perhaps rarely three flowers, often a mere radical peduncle or true scape, fifteen or sixteen inches long, and very smooth. The calyx calyculate, the inner involucrum or calyx composed of a simple rather numerous row of leaflets, the florets bright citron yellow, the pappus simple, even through a lens, copious, brownish.

*Hab.* In Arkansas, collected by Dr. Pitcher.

9. Hieracium **barbatum.* Pilosissimum prælatum, rigidum, foliis integris, radicalibus cuneato-oblongis acutiusculis, superioribus sessilibus multo minoribus sublinearibus, floribus sparsis paniculatis, ramulis brevissimis paucifloris, pedunculis calycibusque pulverulento-tomentosis.

2|. Stem simple, three to four feet high, the lower leaves attenuated into a petiole, and about nine inches long, the upper ones sessile, those on the stem rapidly diminishing to the length of one to one and a half inches and nearly linear; the whole plant, except the panicle, clothed with remarkably long and spreading white hairs, the hairs six or seven lines long. The flowers rather small for the size of the plant, yellow, disposed in a long narrow panicle upon a very stout stem; the peduncles with a few minute subulate leaves, and as well as the calyx, which is

slightly caliculated, covered with a whitish pulverulent tomentum. The pappus scabrous.

*Hab.* In Arkansas, collected by Dr. Pitcher.

10. APOGON **lyratum.* Glabrum, glaucum, foliis difformibus, integris, aut runcinatis petiolatis, laciniis remotis, caulinis amplexicaulibus, caule subdiviso paucifloro, calycibus glabris, floribus subumbellatis.

⊙. Six to eight inches high, primary leaves often wholly entire, roundish oval, the succeeding ones linear-lanceolate and acute, in other specimens deeply runcinate, the teeth very remote and sharp. Stem low and divaricate, with a few simple and sheathing leaves, which come together in an opposite pair beneath the cluster of flowers, which constitute a sort of umbel, either simple or again proliferous into a similar additional umbellate branch. Calyx composed of a *simple* series of leaves. Flowers small, about the size of those of LAPSANA *communis*, from which genus indeed our plant does but slightly differ. The seeds are equally devoid of pappus, oblong, obtuse, somewhat compressed, and also transversely striated. Florets pale orange yellow.

*Hab.* On the margins of grassy ponds in Arkansas, collected by myself and Dr. Pitcher.

11. LIATRIS **pauciflosculosa.* Foliis subconformibus, inferioribus lineari-lanceolatis, superioribus linearibus, acutis glabris, racemo longissimo parvifloro, calycibus

subtrifloris, pedicellis filiformibus, squamis calycinis oblongis obtusis, caule puberulo.

4. Root tuberous, stem pubescent. Raceme about twelve to fourteen inches long, bracts minute. Flowers with about three florets, subcylindric and acute at the base, pedicels filiform. The flowers numerous, and smaller than in any other known species. Allied to L. *pauciflora*.

*Hab.* In Alabama. Dr. Gates.

12. Liatris **brachystachya*. Glaberrima, foliis crebris linearibus acutis, spicis abbreviatis confertifloris oblongis, calyce squarroso sub-5-floro, laciniis oblongis acutis, intimis coloratis.

4. Remarkable for its equal and crowded leaves, short dense sessile-flower spikes, and squarrose pointed calyx leaves; the spike is cylindric-oblong, about three inches in length. Florets about five. Pappus rather short and not very plumose.

*Hab.* In Arkansas. Doctor Pitcher.

13. Liatris **virgata*. Puberula, foliis linearibus sparsis, racemis compositis subpaniculato-ramosis, ramulis subunifloris microphyllis, calycibus subhemisphæricis multifloris, squamis obtusis appressis.

4. Remarkable for the decomposition of its raceme and the long leafy pedicels of the flowers. Florets about eight in each calyx. In cultivation it becomes full of slender wiry branchlets.

*Hab.* In Georgia and North Carolina.

14. Liatris *squamosa. Pulverulento-pilosa, canescens, corymbosa, corymbulis 3—5—floris, foliis radicalibus linearibus longis, caulinis appressis perbrevibus, calycibus subhemisphericis, squamis acutis.

4. A very remarkable and distinct species, with a short, fusiform, tuberous root. The stem simple, sixteen to eighteen inches high, and as well as most other parts of the plant, covered with short, white, close scabrous hairs; the leaves of the stem are so closely appressed as scarcely to appear in profile; the corymb also consists of from three to five very shortly pedicellated flowers, the pedicels leafy just beneath the calyx, whose scales are very pubescent, ovate and acute. The florets are about six to eight; the pappus short and moderately plumose.

*Hab.* In Alabama. Dr. Gates. Presented to the academy's collection by the late lamented Reuben Haines.

15. Grindelia *lanceolata. Glabra, foliis semiamplexicaulibus lineari-lanceolatis inciso-serratis, squamis calycinis filiformibus rectiusculis.

Biennial? Stem smooth, a little branched, the flowers terminal and fastigiate. The narrow acute leaves readily distinguish this from all the other American species.

*Hab.* In Arkansas. T. Nuttall and Dr. Pitcher. Of this genus there are yet some undescribed species in the elevated table lands of Peru.

16. GRINDELIA *pubescens. Foliis amplexicaulibus oblongo-ovatis argute serratis acutis, ramis fastigiatis subunifloris pubescentibus.

Probably biennial. Allied to G. *ciliata*, but with the leaves simply and pungently serrated. The flowers about the same size with those of the allied species. The segments of the calyx lanceolate-linear and somewhat squarrose.

*Hab.* In Arkansas.

17. HELIANTHUS *heterophyllus. Caule unifloro gracili, foliis piloso-hirsutis plerisque oppositis, radicalibus oblongo-ellipticis, superioribus lineari-lanceolatis, omnibus integris, squamis calycinis lanceolatis acuminatis.

4. From one to three feet high. The stem nearly quite smooth, the stem-leaves rough, and suddenly diminishing in size, become extremely small and alternate towards the flower, which is however long pedunculate. Rays bright yellow, twelve to fourteen. The disk brown.

*Hab.* In Alabama.

18. COREOPSIS *involucrata. Foliis oppositis pinnatisectis, foliolis quinis lineari-lanceolatis acuminatis inciso-serratis, involucro hispido calycem superanti, seminibus glabriusculis vix bidentatis.

Annual or biennial, smooth, and with the stem strongly quadrangular. The general habit of this species is entirely that of C. *trichosperma*, but it is well distinguished by the almost smooth seeds scarcely bi-

dentate. The external involucrum is very long, and appears quite hispid.

*Hab.* In Arkansas. Collected by myself and Dr. Pitcher.

19. Coreopsis **ambigua.* Foliis oppositis pinnatisectis, foliolis 3—5 sublanceolatis acuminatis inciso-sublobatis integriusculis, involucro glabro calycem subæquanti, seminibus glabriusculis brevidentatis.

Annual or biennial, nearly allied to C. *trichosperma*, but with the leaves much more entire, the leaflets often wholly so, less compound, very irregularly laciniated, and often only ternate.

*Hab.* In Alabama. Presented by Mr. Cooper.

20. Coreopsis **linifolia.* Glaberrima, foliis oppositis integris, radicalibus oblongo-ellipticis, caulinis linearibus brevibus obtusis, caule sulcato quadrangulo, seminibus bisetosis.

♃. Stem smooth and quadrangular, two to three feet high, branching towards the summit. Root leaves elliptic-oblong, entire, upon long petioles. Stem leaves remote, short linear and obtuse, not much exceeding an inch in length, the tips appearing often sphacelous and truncated. Flower branches bifid or trifid, few-flowered, disposed often by pairs, bright yellow. Rays three-lobed. The seed terminated by two longish awns.

*Hab.* Alabama.

21. Coreopsis **Wrayi*. Glaberrima, foliis pinnatisectis sessilibus, superioribus trisectis, supremis simplicibus, laciniis lanceolato-linearibus integris acutis, radiis elongatis, disco concolore.

Very nearly allied to C. *verticillata*, but with the leaves less compoundly dissected, above simple, and with the disk yellow, as well as the few rather straggling long rays, which are brighter and deeper colored. It retains its character quite distinct in cultivation. I have dedicated this species thus slightly to commemorate the eminent services rendered by my friend Doctor T. J. Wray, of Augusta, to the cause of botanical science and floriculture.

*Hab.* In North Carolina.

22. Coreopsis **oblongifolia*. Hirsutiuscula, caule trichotomo paucifloro, foliis oppositis integris cuneato-oblongis obtusis, pedunculis longissimis, radiis subdentatis integris, seminibus cuneato-oblongis nudis.

A perennial low growing species, rather hirsute in a wild state, and remarkable for its long peduncles and rather small flowers. The outer calyx is short, the segments of the inner oblong-ovate.

*Hab.* In North Carolina and Georgia.

23. Coreopsis **stellata*. Glabra, foliis sessilibus integerrimis ternato-sectis, foliolis lato-lanceolatis utrinque acutis tenuibus, radiis integris, seminibus cuneato-oblongis.

Closely allied to the following species but easily

distinguished by its much thinner and broader leaves.

24. Coreopsis *senifolia*. Villosiuscula, foliis sessilibus integerrimis ternato-sectis, foliolis lanceolatis angustioribus, calycibus pubescentibus, radiis integris, seminibus cuneato-oblongis, caule teretiusculo.

Allied to the preceding, but perfectly distinct. The foliage and the whole plant is closely covered with a dense and short pubescence; the leaves are smaller and narrower, the calyx, inner as well as outer, pubescent; the flowers more numerous, in a paniculated corymb.

*Hab.* In the southern states, from North Carolina to Florida.

25. Rudbeckia **pallida*. Aspera, foliis lineari-lanceolatis longissime petiolatis integriusculis, supremis sessilibus, radiis longissimis dependentibus bidentatis, caule elongato unifloro.

♃. Greatly resembling R. *purpurea*, but with very long petiolated narrow and almost perfectly entire leaves; the peduncle, or part of the stem destitute of leaves, fourteen to sixteen inches long. The rays pale purple, or almost rose red.

*Hab.* Arkansas. Collected by myself and Dr. Pitcher.

26. Rudbeckia *apetala*, Torrey. Scabra, caule elongato unifloro, basi pilossissimo, radii plerisque nulli,

foliis radicalibus subsessilibus latissime ovatis subrotundis.

4. A species remarkable for its frequent want of rays, though sometimes it presents ten or twelve short and slender ones; the floscular florets are dark brown; the base of the stem for a few inches very hairy, and clothed with several pairs of opposite leaves, which are cuneate-ovate, entire, three-nerved and very scabrous; the primary leaves are very broad roundish, about as wide as long, and nearly three inches over either way.

*Hab.* In Alabama, and near Augusta in Georgia.

27. RUDBECKIA **nitida.* Glaberrima, caule nudiusculo subunifloro, foliis coriaceis spathulatis oblongis integriusculis, caulinis paucis oblongis sessilibus, calycibus foliaceis, paleis oblongis retusis apice reflexis.

4. A species remarkable for its extreme smoothness; the leaves being quite lucid, broad oblong, and the stem naturally but little divided, chiefly one-flowered, with a very long naked peduncle. The rays entire, about eight. The seed nearly destitute of crown, and the disk almost hemispherical. A very handsome species for cultivation, being almost entirely hardy.

*Hab.* In Georgia and Florida, on the borders of swampy open thickets.

28. RUDBECKIA **odorata.* Caule folioso paucifloro, foliis petiolatis trifidis hirsutis subtus pubescentibus, laciniis

lanceolatis serratis acuminatis, inferioribus subincisis, calycibus squarrosis, receptaculis hemisphericis.

4. A very distinct species, rather tall, with a very leafy and somewhat scabrous stem. The leaves generally trifid, the central segment lanceolate, three-nerved, serrate and acuminate, sometimes partially three-cleft at its base, or incisely serrated. Peduncles rather long, three or more forming a flat cluster. Calyx squarrose, the segments rough linear and acuminate, formed of several series as in *Helianthus*. Rays entire, yellow, ten to twelve. Receptacular scales short.

*Hab.* The grassy plains of Arkansas. Collected by myself and Dr. Pitcher. This species exhales, on drying, a strong and agreeable odor of vanilla, which continues in the specimens for many years.

29. Rudbeckia **globosa.* Scabra, pumila, ramosa, foliis subsessilibus trifidis, caulinis subquinato-pinnatifidis, laciniis angustissimis integerrimis, floribus subsessilibus rotundatis, radiis brevissimis reflexis.

4. A very distinct and remarkable species, scarcely a span high, and branching almost from the base, hoary and scabrous. The first leaves simple and linear, on the stem pinnatifid and very narrow, the segments scarcely more than half a line in width, the rachis equally wide, uppermost leaves simple. Flowers terminal, yellow, the disk almost globular,

the rays minute. Seed naked. The chaff of the receptacle lanuginously ciliate.

*Hab.* In the Rocky Mountains. Collected in Long's expedition.

30. RUDBECKIA **atrorubens.* Glabra, caule elongato tereti unifloro, foliis angusto-lanceolatis sublinearibus integris basi attenuatis longe petiolatis margine scabris, radiis bidentatis, paleis exsertis lanceolatis acutis.

4. A species closely allied to R. *purpurea* and R. *pallida*, but perfectly distinct in its singular smoothness, very narrow entire leaves, and *dark red* rays, which are very showy from the intensity of their color.

*Hab.* In the plains of Arkansas, and also in Georgia, from whence I have received roots from my indefatigable friend, Dr. T. J. Wray.

31. RUDBECKIA **serotina.* Hirsuta, scabra, caule subunifloro, foliis spathulato-oblongis subserratis subsemi-amplexicaulibus, inferioribus petiolatis trinerviis ovatis, laciniis calycinis lanceolatis, squamis oblongo-lanceolatis pubescentibus brevibus, radiis majusculis aureis.

4. A species with much of the habit of R. *spathulata*, but perfectly distinct in its more robust habit, much shorter receptacular scales and larger flowers. It is also allied to R. *hirta*, but smaller, narrower leaved, and with the leaves almost entire or obscurely serrulated. In cultivation it flowers much

later than either of the preceding. The flowers are bright yellow, with a dark purple disk, and in the garden the plant produces a few straggling branches. The wild plant is extremely asperate to the touch.

*Hab.* In Arkansas and Georgia.

32. RUDBECKIA **bicolor.* Annua, pilosa, scabriuscula, caule subunifloro, foliis oblongis sessilibus rariter subserratis obtusiusculis, inferioribus subovatis petiolatis, laciniis calycinis oblongis, squamis lanceolatis hirsutis, radiis brevibus bicoloribus.

⊙. A strikingly beautiful species from the color of the rays, which are for one half of their length of an intense blackish-brown, with the gloss of velvet, and the other half yellow. The stem in the wild plant is generally unbranched and about eighteen inches high. It is somewhat related to the preceding species, but the flower is entirely different, the leaves all nearly oblong and softly hairy.

*Hab.* In Arkansas and near to Red river.

33. FLAVERIA **tenuifolia.* Glabra, foliis oppositis angustissimo linearibus integerrimis, floribus corymbosis, radio unico, plerisque nullo.

4 ? Branches somewhat angular. Leaves partly succulent, one and a half inches or so, apparently scarcely more than half a line wide; the axils leafy. Corymb many flowered, the branches in threes. The corymb decomposed, the flowers closely aggregated, yellow. Calyx five-leaved, imbricate, the scales ob-

long-linear. Florets about five to seven, one of them sometimes ligulate, and feminine only; the floret flat oblong and entire. Receptacle naked. Seed naked, black, cylindric, oblong, with ten rather elevated smooth striæ.

*Hab.* East Florida. Mr. Peale.

SELLOA *nudata.* Nuttall, in Silliman's Journal, vol. 5, p. 300, from an imperfect specimen.

34. ASTER **Collinsii.* Puberulus, scaber, foliis conformibus cuneato-oblongis serratis tortuoso-patulis acutiusculis, corymbo composito, calycibus cylindricis imbricatis, squamis subscariosis oblongis acutiusculis adpressis, radio sub-5-floro.

4. Probably the true ASTER *tortifolius*, as the leaves are much more remarkable for their position than in that species, from which however it scarcely differs in any respect, except by the serratures of the foliage, uniformly wanting in A. *tortifolius* of Pursh. The flowers are white, with very few and narrow rays. The pappus white and very copious, scabrous.

*Hab.* West Florida. Mr. Ware.

These, with A. *conyzoides* and A. *solidaginoides*, form a very distinct section or subgenus, which I propose by the name of *LEUCOCOMA.

35. ASTER *adnatus.* Scaber, microphyllus, foliis cordato-oblongis acutis integris supra medium caudi adnatis, radicalibus oblongis, ramis elongatis subunifloris.

♃. A species nearly related to A. *squarrosus*, but extremely remarkable for the disposition of the leaves which are very minute, near together, and adnate by their upper surfaces, more than half their length, to the sides of the stem and branches. The flowers are rather large, and pale lilac, the calyx scales oblong and appressed. Pappus very slightly scabrous.

*Hab.* In Alabama and West Florida. Common.

## *Warea.

Calyx 4-sepalus, deflexus, caducus, coloratus. Petala 4, longissime unguiculata, patentia. Siliqua bilocularis, stipitata, plana, margine utroque seminifero. Semina planiuscula striata. Cotyledones accumbentes.

Herbæ annuæ integrifoliæ, floribus subumbellatis racemosis purpureis. *Cleomis* facie.

36. Warea *amplexifolia.* Foliis oblongo-ovatis semiamplexicaulibus, siliquis ancipitibus pendulis. Stanleya *amplexifolia*, Nuttall, in Silliman's Journal, vol. 5, p. 297. Plate 10.

☉ About a foot high, very smooth. The leaves alternate, smooth, entire, sessile and amplexicaule, scarcely more than half an inch long, somewhat cordate-ovate or oblong. The raceme short, resembling an umbel, containing many flowers of a fine lilac purple apparently, by the dried specimens. The segments of the calyx long, above oblong and obtuse, attenuated below somewhat in the manner of the petals, and nearly of the same fine color, caducous and

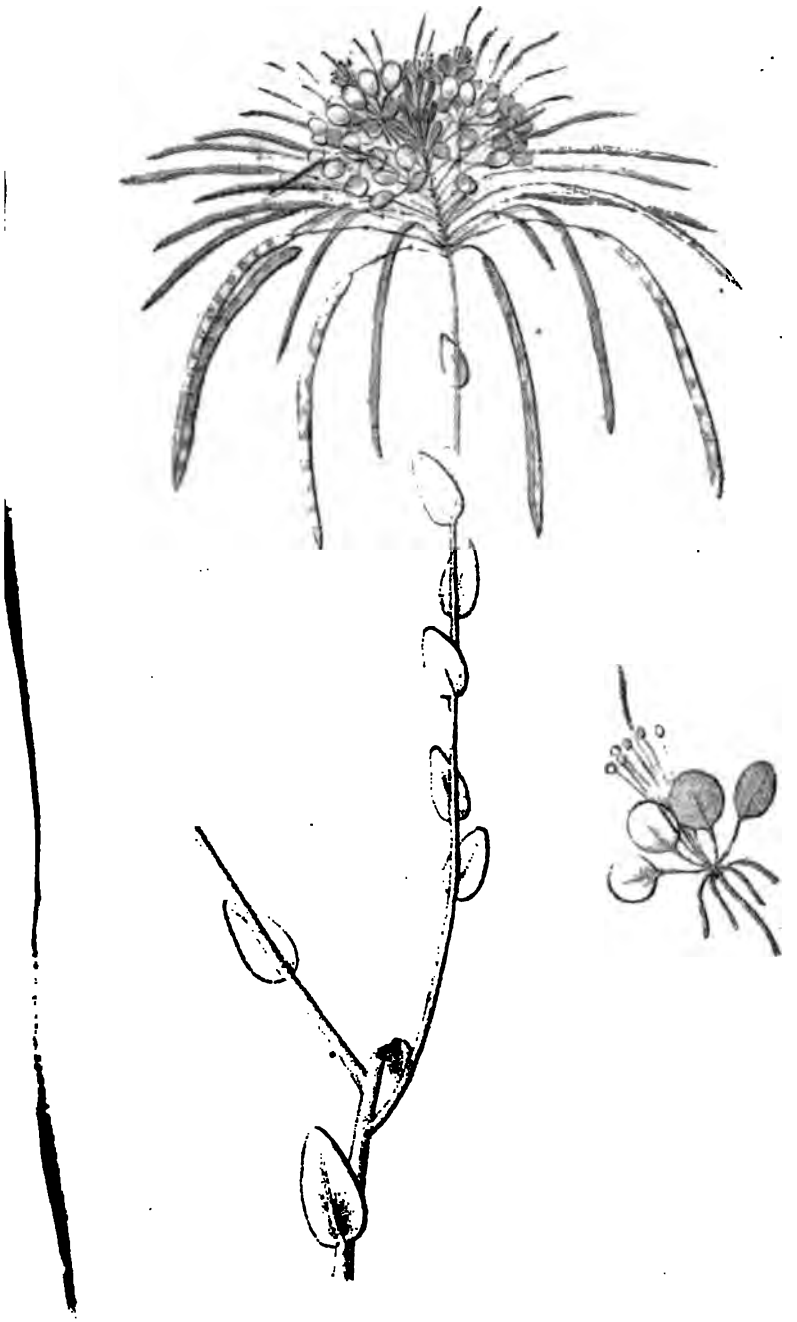
reflected backward so as to appear pendulous. The petals upon very long and slender claws, spreading, the border oval. Stamens six, also very long, exceeding the petals, arising from the same torus. Style none; stigma minute, the pedicel of the pod about half an inch long; the pod about one and a half inches, narrow linear and flat, the dissepiment equal with the valves; a strong central vessel passes down the centre of each valve. The seeds small, brown, curvingly striated, oval, attached alternately on either side of the edge of the dissepiment. The cotyledons straight, and the radicle curved over on to the edge of their junction.

*Hab.* In West Florida. Discovered by my friend N. A. Ware, Esq., to whom, as a just tribute for his varied and unwearied exertions in the cause of natural science, and particularly in Botany, I beg leave to dedicate this curious plant.

37. WAREA *cuneifolia.* Foliis subsessilibus obovato-cuneatis, basi attenuatis. CLEOME *cuneifolia,* Muhl. Catal., Elliott Flora, 2, p. 150. STANLEYA *gracilis,* Decand. Prod. 1, p. 200.

⊙. Very similar with the preceding, but with the leaves attenuated below, and about an inch long. The flowers are also smaller and white.

*Hab.* On sandy barren grassy ridges in the southern parts of Georgia, Alabama and West Florida, v. v.



WAREA AMPLEXIFOLIA.

Besides other marks of distinction betwixt the *Warea* and *Stanleya*, I would remark, that in the latter the radicle in the seed is straight.

These two genera appear to compose a very distinct natural order, intermediate between the CRUCIFERÆ and CAPPARIDÆ, but they are more decidedly allied to the latter than the former; their physical properties are indeed the same. I would propose to designate this remarkable groupe by the name of STANLEÆ. With the calyx of four deciduous or caducous petaloid conspicuous sepals, the petals four, and unguiculated. The stamens six, originating on the same torus with the petals. The fruit usually a linear silique of two valves, divided by a complete and perfect dissepiment; the seed disposed in two series. The cotyledons accumbent, or with the radicle straight. The seed also without the *perforated cleft* of Cleome, in which, in fact, the curved radicle is separated from the cotyledons by the entire interposition of the integument of the seed.

### *CRISTATELLA.

Calyx foliaceus 4-partitus. Corolla 4-petala, 2 multo minora fimbriato-laciniata. Parapetala unica, vaginata, truncata. Stamina declinata, 10—14. Siliqua oblonga acuminata, in calyce stipitata.

Herba annua, viscida, trifoliata, albiflora, *Polanisiæ* affinis.

38. CRISTELLA *erosa*. Plate 11.

⊙. Eight to twelve inches high, the stem somewhat branched, and as well as the leaves slenderly sprinkled with a short viscid pubescence. The leaves remarkably narrow, trifoliate, upon rather long and slender petioles, the leaflets filiform, linear and acute, about an inch long. Flowers in a short leafy raceme, rather long pedunculate. Calyx green and leaf-like, four-parted and short, the segments bluntly ovate. Petals four, unguiculate, all ascending towards the upper side of the flower, the two larger roundish wedge-shaped and erosely torn at the extremity, the two lesser petals very short, their laminæ torn into a tuft of fringe. From amidst the petals spring a petaloid process of a yellow color, of the form of a tube truncated at its extremity, and cleft on the under side to its base. Stamens long and declinate, ten to fourteen. Silique long and stipitate, terminated by a long attenuated style, and a minute stigma.

*Hab.* On sandy barren hills, near the Kiamesha, in the vicinity of Red river, Arkansas. Found also by Dr. James, No. 25 of Torrey's Catalogue. Flowering in June and July.

39. POLYGALA **Boykini*. Floribus cristatis, caule simplici, foliis 4—5 verticillatis oblongo-ovalibus lanceolatisve acutis, supremis sparsis, spica solitaria longe pedunculata, laxiflora.

Nearly allied to P. *bicolor* of Kunth, a species indigenous to Mexico; but the present is a perennial, possessing, in general, the same medicinal virtues as the P. *senega*, which it also resembles. The stems, several from the same root, are almost perfectly simple, with very unequal verticillated leaves, the lower ones short and oval, the upper lanceolate verticillate in fours and fives, the uppermost alternate. Spikes generally solitary on long peduncles, the spike loose filiform. The flowers greenish-white, slightly cristate.

*Hab.* In Georgia and Florida; discovered by my friend Dr. Boykin, to whom, as a practical botanist, I take the liberty of dedicating this species.

### *Leucospora.

Calyx 5-partitus. Corolla tubulosa, vix campanulata, obtusa, 4-fida. Capsula 1-locularis demum quadrivalvis, polysperma.

Herbula annua ramosa viscida, foliis ternato-verticillatis trifidis, flores solitarii axillares. *Gratiolæ* accedens.

40. Leucospora *multifida*; Capraria *multifida*, Mich. Flor. Boreal. v. 2, p. 22, t. 35, Pursh, Nuttall, &c.

A plant of very distinct habit from Capraria and much more closely allied to Gratiola. The corolla is nearly equal and almost wholly tubular, expanding a little at the border, which is bluntly four-lobed, with the upper segment emarginate. The seeds are nu-

merous, almost perfectly white and diaphanous when quite ripe, and hence the generic name; they are also (when seen through a lens) longitudinally grooved. The capsules are quickly disposed to dehiscence, and usually part to the base into four lanceolate valves; the central placentia is narrow and almost columnar. The flower pale rose red, small and very fugacious. It grows abundantly on the banks of most of the large western streams, the Ohio, Mississippi, Missouri and Arkansas.

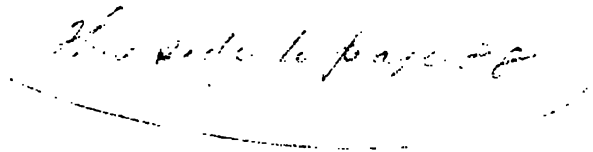
### *Conradia.

Calyx 5-fidus foliaceus. Corolla monopetala cylindracea subæquali, apice 5-dentato, dentibus reflexis. Stamina 4, vix declinata subæqualia longe exserta. Stylus longissimus. Stigma minuta. Capsula brevi-ovata, 2-locularis, polysperma.

Herba magna perennis, foliis oppositis sublyratis. Flores axillares, racemosi, flavi. Habitu *Gerardiæ* sed flores vix inequales.

41. Conradia *fuschioides*. **Glabra**, foliis lanceolatis petiolatis sublyrato-pinnatifidis, lobis extrorsum denticulatis, calycibus foliaceis, laciniis exsertis denticulatis. Plate 12.

4. A very showy and extraordinary plant, with the stem probably three or four feet high. The leaves greatly resemble those of Gerardia *quercifolia* (as well as the whole plant, quite black in the dried specimen.) The flowers have rather long and



CONRADIA ETISCHIOIDES

CONRADIA [illegible]

slender peduncles. The calyx is remarkable for its foliaceous divisions. The corolla and long exserted stamens put one in mind of some gigantic *Fuschia*, the corolla being tubular, with its five terminal and almost equal oblong-ovate teeth reflected. The filaments are pubescent and originate near to the base of the corolla; the anthers are long and linear, a little declinate, but of almost absolutely equal length. The style is very long and slender, with a very minute and inconspicuous stigma. The germ is broad ovate and acute, but short, as in *Seymeria*. A second species exists in the herbarium of Professor Torrey.

In accordance with my friend Mr. C. Pickering, we dedicate this genus to the memory of the late Solomon W. Conrad, of Philadelphia, an assiduous botanist, and late Professor of Botany in the University of Pennsylvania.

42. Malvaviscus **Floridanus*. Pilosus, hirsutus, herbaceus, foliis cordato-ovatis crenatis obtusiusculis parvis brevi petiolatis, pedunculis axillaribus nutantibus ad apicem rami.

♃? A low branching small leaved species, covered more or less with short hispid forked hairs, the leaves almost sessile. Peduncle articulated near to the calyx. External calyx about eight parted, the segments rather long and linear, narrowed at the base; internal calyx 5-cleft. Flower scarlet, greatly resembling that of the M. *arboreus;* the corolla

equally closed and convoluted, but smaller. Collected by Mr. Titian R. Peale, in Florida, near Key West.

43. Sida **glabra.* Pumila, ramosa, glaberrima, foliis lineari-oblongis sublanceolatis inciso inæqualiter serratis, brevi-petiolatis parvulis, floribus axillaribus aggregatis, carpellis sub-10, bidentatis.

⊙ ? Scarcely more than a span high, with the general habit of S. *rhombifolia.* Leaves about an inch long. Stipules setaceous. The flowers small and yellow, at length so aggregated as to crowd the branches. The calyx very wide, angularly plaited; the segments acuminated.

*Hab.* In Florida. Mr. T. R. Peale.

44. Rhamnus **ferrugineus.* Foliis alternis oblongo-ellipticis acutis integris, junioribus calycibusque ferrugineo-tomentosis, umbellulis petiolaribus sessilibus, floribus androgynis pentandris, stigmatibus trifidis.

A shrub or tree remarkable for the ferruginous down with which the young leaves in particular and the calyx are clothed. The leaves are about two inches long, elliptic, or elliptic-oblong and acute, slightly pubescent beneath when adult. The flowers, from ten to twenty, come out in clusters from the base of the petiole, and are situated towards the ends of the branches; the pedicels are about two or three lines long. The calyx five-cleft, the divisions oval acute, or ovate, very thickly clothed beneath with rusty

down, above apparently yellowish, the petals partly involving the stamens, at first oblong, narrow and attenuated below. Style short, with the stigma three-cleft.

*Hab.* Near Key West, in Florida. Mr. T. R. Peale.

45. Rhamnus **Shortii.* Fruticosus, glabriusculus, foliis oblongo-ovatis acuminatis tenuissime serrulatis, floribus tetrandris apetalis terno-aggregatis, stigmatibus binis, baccis dispermis.

A small shrub with a smooth whitish bark and moderate sized leaves, (their length about two inches, with a breadth of little more than an inch,) nearly smooth, oblong-ovate or oblong-lanceolate, and acuminate, very minutely and closely serrulate, the nerves beneath slightly pubescent. Flowers only associated by threes; sometimes also solitary. The style rather long, the stigmas two, distinct; the berry with two large flattish seeds.

*Hab.* On the high clifts of Kentucky river. Flowering in May. Discovered by my botanical friend Dr. Short, (supposed by him, the R. *lanceolatus* of Pursh,) with which it is easily confounded, considering the very vague and unsatisfactory description given; I have therefore great satisfaction in dedicating this very distinct species to its discoverer, so well known for his success and assiduity in botanical researches in the western states.

46. PETALOSTEMON *gracile. Glaberrimum, decumbens, spica cylindrica brevi, bracteis acutis longitudine calycis deciduis, dentibus calycinis brevibus glabris, foliolis 3-jugis lineari-ellipticis, floribus albis.

4. A very distinct species, remarkable for the slenderness of its assurgent weak stems, of which probably many spread out from the same root. The leaves and the whole plant is much smaller than P. *candidum*. The primary leaves are trifoliate, the upper pinnate, the uppermost often simple; the flowers terminal, upon longish stalks, clothed with two or three small simple leaves; the spike seldom attaining more than half an inch, often less; the bracts small and pointed; the calyx teeth short and scarcely acute, at length appearing sometimes a little downy on the margin of the segments; petals white, oblong.

*Hab.* In the lower part of Alabama and Florida.

47. PETALOSTEMON *multiflorum. Caule erecto, ramulis fastigiatis subcorymbosis, capitulis brevibus oblongis, calycibus pulverulis bracteis longioribus, floribus albis, foliolis (9) lineari-oblongis abbreviatis.

4. Stem erect, about a foot high, branchlets terminating each in a capitulum towards the summit of the stem so as almost to produce a corymb. The spikes short and almost oval-cylindric; the bracts not so long as the calyx. Calyx nearly smooth,

slightly pubescent on the margins of the segments, which are short and ovate. Leaflets about four pairs, narrow oblong, obtuse and short, beneath resinosely punctate.

*Hab.* In the plains of Red river.

48. PETALOSTEMON **decumbens.* Parce pubescens, caule decumbente a basi ramoso, spicis cylindraceis crassis, bracteis acuminatis calyce pubescente longioribus, floribus purpureis, foliolis latiusculis (7—9) cuneato-oblongis apiculatis.

4. A very showy purple flowered species allied remotely to P. *violaceum*, but with larger longer and denser spikes. The angular decumbent stem and younger leaves are slightly pubescent. The leaves about as broad as in P. *candidum*, the leaflets seven to nine, cuneate-oblong and about a line wide (though sometimes narrower.) Stipules small and setaceous. The calyx much less villous than in P. *violaceum*, only pubescent on the margins of the segments, which are short and scarcely acute. The bracts acuminate setaceous, longer than the calyx. Petals violet purple, retaining their fine color in the herbarium like the other species.

*Hab.* On the plains of Red river, common. Flowering in June.

### *PITCHERIA.

Calyx tubulosus, subbilabiatus, 5-fidus, laciniis subulatis, labio superiore inferiori æquali bifido. Alæ angustatæ

basi subulato-unidentatæ. Stamina diadelpha. Stylus filiformis, adscendens. Legumen oblongum, 2-spermum, vix calycem excedens.

Herba perennis resinoso-atomifera ramosa erecta trifoliolata; stipulis obsoletis, minutissimis; flores solitarii nudi axillares rubri.

49. PITCHERIA *galactoides*. 4. Stem erect, rigid, sending off many axillary long simple branches, in the manner and with the entire habit of BAPTISIA *tinctoria*. The stem smooth, the branches minutely pubescent. Leaves rather small, trifoliate, almost sessile, elliptic or elliptic-obovate, obtuse, smooth, having glandular dots beneath. The flowers a fine red, rather small, shortly pedunculate, axillary and generally solitary, sometimes, though rarely, by twos. The calyx before expansion, entirely resembling that of HEDEOMA *glabella*, somewhat nutant, tubular, green, and partly two-lipped, the lower three-toothed or parted, acuminate; the upper lip of one cloven tooth equally pointed, and of the same length with the lower lip. Vexillum roundish-oblong. The wings narrow, and sending out from the base of each a long subulate tooth. Keel conspicuous and rounded. The stamens diadelphous. Style filiform, very long, the stigma scarcely visible. Legume oblong, its point ascending, villous in the germ, two seeded.

*Hab.* Alabama and West Florida. (Herbarium of the Academy.) The ripe pod I have never seen. This genus, allied to *Galactia*, from which, however,

it is perfectly distinct, I have dedicated to Doctor Pitcher of the United States army, whose botanical researches in the territory of Arkansas have been so persevering and successful.

## *Pickeringia.

Calyx parvus, 5-partitus, inferus. Petala 5. Stamina 5, anthera sagitata. Stylus simplex. Capsula 1-locularis, subglobosa, polysperma.

Frutex sempervirens, folia integra alterna; flores paniculati.

50. Pickeringia *paniculata*; Cyrilla *paniculata*, Nuttall, in Silliman's Journal of Science, vol. 5, p. 290.

An evergreen shrub, pretty thickly clad with entire, rather small coriaceous, wedge-oblong obtuse and entire leaves. The panicle is rather large and many-flowered, the flowers themselves (not expanded in my specimens) strongly resemble those of the *Mylocarium*. The calyx is rather minute, the segments oblong and obtuse. The petals are oblong and spotted or lined with blackish or purple spots. The stamens 5, a little shorter than the petals, with the anthers two-celled, the cells diverging at the base so as to appear sagittate, but the lobes are without points or awns; their dehiscence is oblique. Style one, rather long and filiform. Stigma minute and undivided. Germ superior, globular, one celled, many-

seeded, the seeds small and apparently attached to a central receptacle as in *Lysimachia*.

*Hab.* East Florida. Mr. Ware. The natural affinity of this genus is apparently to Cyrilla and the ERICEÆ, but the ripe capsule is yet unknown.

This plant is dedicated to Charles Pickering, M. D., the principal curator of the herbarium of the Academy of Natural Sciences.

51. BAPTISIA? **simplicifolia*. Foliis simplicibus rhomboideo-ovatis obtusis glabris exstipulatis.

Of this plant I know nothing more than what can be derived from a single branch destitute of flowers, which I have received by the above appropriate name from my joint botanical friends Dr. H. Loomis —— Croom, Esq., the latter now a resident in West Florida, from whence he obtained the fragment of this very curious and extraordinary BAPTISIA. The branch is angular, and the leaves are somewhat coriaceous and closely and minutely reticulated as in the rest of the genus.

From Mr. Croom I have at the same time received a branch of a species of TOXUS, probably the T. *montana* of Mexico, which according to Mr. C. attains to the magnitude of a considerable tree. Its leaves are apiculated as described by Willdenow, but there is no obvious inequality at their base.

52. BAPTISIA **sphærocarpa*. Glaberrima, foliis sessilibus, foliolis oblongo-lanceolatis obovatisque obtusis, stipulis subulatis minutis, leguminibus brevissimis subglobosis, spicis elongatis terminalibus.

A very showy species, with large deep yellow flowers, in very erect and long spikes. The buds slightly sericeous. Calyx four-toothed, the three lower segments acute, the upper one obtuse, all smooth.

*Hab.* In the plains of Arkansas, in depressed situations by the margins of small streams.

53. BAPTISIA **microphylla*. Foliis simplicibus sessilibus cuneato-subrotundis, superioribus subamplexicaulibus, stipulis subrotundis, floribus axillaribus solitariis, leguminibus brevibus subglobosis.

A very remarkable species, allied to B. *perfoliata*, which I know merely from winter vestiges. It is perennial like the rest of the genus, much branched, with the leaves somewhat less than an inch long, roundish, and of nearly the same breadth, cuneate at the base, where they are approached by the round leafy stipules. On the upper part of the stem, one of the stipules, and sometimes both, coalesce in the leaf, and thus present an amplexicaule base to the foliage. The peduncles are short, solitary and axilary; the pod conspicuously stipitate, short; round and acuminated by the persistent style. The seg-

ments of the calyx appear to have been blunt, and about four.

*Hab.* West Florida and the contiguous parts of Alabama.

54. NEOTTIA **odorata.* Caule folioso glabro, foliis lanceolatis acuminatis, radicalibus longissimis, spica laxiuscula, floribus recurvatis, labello ovato integro, margine undulato subfimbriato.

The largest and finest *Spiranthes* in the United States, possessed also of a very sensible and delicate fragrance. The flowers white, slightly inclining to green. The root runs considerably, and possesses very thick branching fibres. The leaves are also very long and numerous; the bracts nearly the length of the flowers, and sharply acuminate; the lip entire and delicately edged with a slender curling fringe. It flowers late, and grows along the borders of the Neuse river, at Newbern, in North Carolina, on the wet and muddy shores along with the ERYNGIUM *Virginianum.*

55. NUTTALLIA **cordifolia.* Pubescente-scabra, foliis inferioribus cordato-ovatis mucronatis crenatis subangulatis, superioribus a basi hastato-incisis, caule nudiusculo, floribus aggregatis subumbellatis, calyce calyculato.

Perennial. The root tuberous, branching and descending. The leaves scabrous, the hairs stellated, the leaf five or six inches long, entire, widely sinuated at base, extending sometimes with a long point.

Several stems from the same root, but slightly branched and somewhat decumbent; peduncles very long, terminating in rather close clusters of large purple showy flowers, each calyx provided at base with a three-leaved leafy involucrum, the segments spatulate, divisions of the calyx ovate acute. Carpells, as in *Malva*, not spontaneously dehiscent, and each containing but a single seed. Found by my friend Dr. Wray, in the vicinity of Augusta, in Georgia.

56. JEFFERSONIA **lobata*. Foliis binatis inciso-lobatis, lobis acutiusculis.

Perennial. The leaves glaucous beneath. Scarcely in any way distinguishable from the J. *diphylla*, except by the lobed leaves; each leaflet presenting about five coarse irregularly ovate divisions. The flowers white and fugaceous. The petals oblong.

*Hab.* In Georgia and Tennessee.

57. BIDENS **petiolata*. Glabra, foliis simplicibus petiolatis angusto-lanceolatis utrinque acuminatis serratis, floribus discoideis, calyce exteriore mediocri.

⊙. Low, but considerably branched. The leaves all entire, attenuated below into a longish petiole, the smaller branch leaves often nearly entire. The outer calyx small. The flowers without rays and rather small.

*Hab.* On the margins of ponds in various parts of New England.

58. PYCNANTHEMUM **Loomisii.* Floribus cymosis multibracteatis, bracteis lanceolatis acuminatis incanis, foliis petiolatis ovatis subserratis acutis brevibus superne glabris, dentibus calycinis abbreviatis acuminatis apice pilosis; floribus maculatis.

4. Allied to P. *incanum*, from which it is however readily distinguished by the shortness and comparative smoothness of its leaves, lower growth, and conspicuous spotted flowers. The cyme chiefly terminal, large, the bracts hoary and canescent, the exterior ones, as the leaves, with longish petioles, the rest crowded, narrow lanceolate. Calyx tubular, the dentures rather short but acuminate, each terminated by a short tuft of a few hairs. Corolla pale pink or white, with elegant carmine spots; segments of the corolla oblong. A very beautiful species possessing the scent of Pennyroyal.

*Hab.* In Georgia.

I have dedicated this very distinct species to Dr. H. Loomis, of Newbern, in North Carolina, a gentleman who has devoted much attention to botany, and in concert with Mr. Croom, published a catalogue of the plants of his neighborhood.

59. PYCNANTHEMUM **setosum.* Puberulum, foliis ovatis acutis subserratis vix petiolatis, ramis fastigiatis, capitulis terminalibus multibracteatis, bracteis subulato-setaceis,

dentibus calycinis promisse acuminatis. P. *aristatum*, Pursh, non Mich.

4. A lowish growing species, with almost exact ovate leaves from one to one and a half inches long. The heads of flowers rather small, and with almost similar setaceous bracts and calyx with the P. *aristatum* of Michaux.

*Hab.* In Maryland. Herbarium of the Academy.

60. Solidago **uliginosa*. Glaberrima, racemis erecti-usculis brevipaniculatis subfastigiatis, caule simplici attenuato, foliis inæqualibus, caulinis integris lineari-lanceolatis sessilibus, inferioribus radicalibusque appresso-serrulatis oblongo-lanceolatis promisse attenuatis petiolatis.

A very smooth, rather tall and branchless species. The lower leaves oblong-lanceolate, somewhat obtuse; the stem leaves much smaller, oblong-lanceolate, or simply oblong and acute or apiculate; the panicle very short, made up of small racemes, which are a little secuned. Florets about ten; rays five, short; scales of the calyx appressed.

*Hab.* In sphagnous swamps and marshy thickets, in Massachusetts. Dr. Pickering, v. v.

61. Solidago **Pitcheri*. Racemis secundis; glabra, foliis conformibus lævigatis crebris oblongo-lanceolatis utrinque acuminatis argute serratis, panicula pyramidata breviuscula parviflora, pedicellis pubescentibus, ligulis abbreviatis.

Remarkable for its smoothness, and the almost uniform size of the leaves, which are about middle size, and terminate in attenuated setaceous points. It has some affinity to S. *arguta;* its habit is that of S. *caroliniensis,* but the leaves are not conspicuously nerved.

*Hab.* In Arkansas. Dr. Pitcher.

62. SOLIDAGO **radula.* Racemis erectiusculis; puberula, scaberrima, foliis oblongis sessilibus integris subreticulatis crassiusculis, inferioribus, paniculis contractis subracemiformibus, squamis calycinis oblongis, ligulis brevissimis.

A very scabrous species with rigid entire leaves, and a narrow racemose panicle.

*Hab.* In Arkansas.

63. SOLIDAGO *squarrosa.* Pulverulenta puberula, racemis laxis paucifloris axillaribus paniculatis, floribus majusculis, ligulis elongatis, foliolis calycinis reflexis, foliis oblongo-ovatis integris subsessilibus, inferioribus obovatis subserratis.

Allied to S. *puberula.* Indigenous to the southern section of the union exclusively, and therefore quite distinct from the S. *squarrosa,* which I described in the American Genera and Catalogue of Species. To that species I therefore now propose the name of SOLIDAGO **confertiflora.*

64. Solidago *hirsuta. Subpilosa, racemis erectis, caule simplici, floribus subracemoso-glomeratis, foliis sparsis elliptico-ovatis, radicalibus spathulatis crenulatis.

A simple stemmed attenuated species nearly allied to S. *pulverulenta* and S. *bicolor*. The lower part of the stem and midrib of the root leaves beneath conspicuously pilose. Flowers yellow, the rays very short, scales of the calyx linear-oblong.

*Hab.* In Kentucky. Dr. Short.

65. Pinguicula *australis. Glabra, nectario brevissimo incurvo, floribus majusculis.

With the whole aspect of P. *vulgaris*, the leaves almost equally involute and broad. The scape smooth. The segments of the calyx oblong and nearly smooth. The corolla about the size of that of P. *vulgaris*, lilac-purple, the lobes obtuse, the nectary incurved and a little longer than the segments of the calyx, entire at its extremity. The corolla smooth also within.

*Hab.* In West Florida.

66. Gratiola *Floridana. Glabra, erecta, foliis lanceolatis obsolete denticulatis acutiusculis, pedunculis folio longioribus, floribus majusculis, laciniis emarginatis.

⊙. About a span high and erect, the leaves longer and narrower than in G. *Virginica*, which it closely resembles, but has much larger flowers of a pale yellow. The calyx and bracts are very small, and the segments of the corolla conspicuously emarginated.

*Hab.* Near Chipola, in West Florida. Flowering in March.

67. KRIGIA **occidentalis.* Glabra, pusilla, foliis sublyratis attenuatis, scapo nudiusculo unifloro, calycis laciniis ovato-lanceolatis, setis pappi brevissimis.

A small species nearly allied to K. *Virginica*, but distinguishable by the broadness of the calyx leaves, which are about six to eight, and particularly by the five short awns of the pappus, which but little exceed the external paleaceous crown in their length. The seed itself is also less angular, but like that species marked with numerous longitudinal striæ, which are transversely rugose.

*Hab.* In Arkansas, near Fort Smith.

68. TEPHROSIA **onobrychoides.* Erecta, ferrugineo-pilosa, foliis subsessilibus, foliolis numerosis (16—24) cuneato-oblongis obtusis mucronulatis, racemis longissimis terminalibus multifloris, dentibus calycinis inæqualibus brevibus.

Allied to T. *paucifolia* but distinct. The largest and finest species in the United States. The pubescence various, as well as the number of leaflets. The raceme terminal, twelve to sixteen inches long; the flowers conspicuous, much resembling those of *Hedysarum*, and hence the specific name which, with Dr. Pickering, I have adopted. The calyx is unequal as in *Lathyrus*, the lowest segment acuminated, the two lateral ovate and acute, the uppermost two short

teeth, partly united and short. Legume long and villous. Flowers red.

*Hab.* In the plains of Arkansas.

69. Tephrosia **elegans.* Decumbens, parce pubescens, foliis subsessilibus, foliolis (15—17) oblongo-ellipticis acutiusculis, pedunculis filiformibus pancifloris folio longioribus, calycis laciniis acuminatis.

4. A decumbent and nearly smooth species, with numerous leaflets and long filiform peduncles producing a few reddish-purple flowers towards their extremities. Legume villous.

*Hab.* In Alabama.

70. Tephrosia **holosericea.* Erecta, sericeo-pilosa, foliis subsessilibus, foliolis numerosis (21—25) lanceolato-oblongis acutiusculis, racemis brevibus sessilibus grandifloris, laciniis calycinis omnibus acuminatissimis.

4. Nearly related to T. *Virginica*, but with the leaflets more numerous and approximating, and with the whole plant sericeous, scarcely excepting the upper surface of the leaves.

*Hab.* In the plains of Arkansas.

[71. Podostemon **abrotanoides.* Fronde ramosissima, laciniis penultimis capillaceis dichotomali-multifidis, spatha florali elongata.

Nearly allied to P. *ceratophyllum*, but a much larger and more compoundly divided plant, the frond almost like the leaves of Fennel, the penultimate gene-

ral divisions like ARTEMISIA *abrotanum*. Peduncles two or three together, short and sheathed, the sheaths being similar with the *stipules*. Capsule oblong-oval, two-valved, one-celled, with ten conspicuous external striatures. The placenta flattened somewhat at the edges, but free, presenting the appearance of a cellular partition. The seeds minute, oblong-elliptic, smooth, pale brown, rather compressed, imbricated over the placenta.

*Obs.* The P. *ceratophyllum* varies much according to the depth of the water in which it grows; in shallow situations it is very short, wiry and rigid, and clothed with obvallate sheaths, without any foliaceous expansions except at the summit of the branches from whence arise the flowers. At other times it becomes almost capillary, presents scarcely any appearance of stipules, and the leaves are divided into a few straggling laciniæ. P. *abrotanoides* gives the appearance of a submerged green field of some kind of *Fucus* to the shallow water of the Chatahoochee, and is much sought after as a pasture by the deer and domestic cattle. Like the *Fuci*, the *Podostemon* is destitute of any roots, as distinct from the stem, the purpose of radication being similarly supplied by a foliaceous expansion at the base of the frond, which thus clings to pebbles and rocks in whatever part it happens to come in contact, by exhausting the atmosphere which intervenes.

As no natural order approaches to this genus, it

may be fairly considered as an insulated form, by the ordinal name of PODOSTEMONEÆ, characterized by the absence of all perianth, a stipule answering that purpose. The stigmas two. The capsule of one cell, with two spirally striated valves, and a central placenta supporting many small imbricated naked seeds. It is also physically distinguished by its remarkable habit, which is similar to that of a *Fucus*. Its texture is cellular, coriaceous and olive green, without root, clinging by absorption to rocks, stones and gravelly soil; and yet with all these discrepancies as a phenogamous plant, its leaves are provided with stipules, and the flowers with true anthers, capsules and seeds!

The genus *Marathrum* of Humboldt and Bonpland, belongs to this natural order. These authors also inform us of the existence of a third species of *Podostemon* in tropical America, and of a fourth in the island of Madagascar.

### *PETALANTHERA.

Calyx superus, 10-partitus. Petala 0. Stamina 5, antheræ sagittatæ, sub apice filamentorum petaloideorum insertæ. Stylus 1. Stigma subbilobum. Capsula cylindracea, 1-locularis, 1-sperma.

Herba annua? aspera, foliis alternis sinuatis, flores capitati, multibracteati.

72. PETALANTHERA *hispida*. Annual or biennial. Clothed with the hispid compoundly barbed pubes-

cence of *Mentzelia* and *Bartonia*. The under surface of the leaves hoary, with a matted rather hispid pubescence (greatly ramified when viewed through a strong lens.) Leaves alternate, with small abortive foliaceous branchlets in their axils, sinuately pinnatifid, attenuated into short petioles, with the segments entire. Flowers in pedunculated heads, subtended by a multifid involucrum of linear and very hairy segments. Calyx superior, ten-cleft, the segments linear, hairy. Corolla none. Stamina five, the filaments flat and short, attached to the sides of the calyx externally, somewhat hairy, like the segments of the calyx. Anthers sagittate, terminating above in petaloid straw-white lanceolate hollow and imperforate cusps. The pollen falling out in agglutinated granular masses. Style one, situated in the centre of the operculum of the capsule. Stigma capitate, about two-lobed. Capsule one-celled, cylindric, inferior; ovules about two; perfect seed one, with a large and fleshy perisperm.

*Hab.* In the Rocky Mountains. Dr. James.

*Obs.* A very singular genus of the LOASEÆ, allied in part to *Mentzelia*, but very remote from the rest of the order in the definite number of the stamens, the ten-cleft calyx and the want of petals. The petaloid filaments are about the breadth of the calyx segments from which they arise, flat and externally also hairy as in the calyx, appearing merely an inner row of segments. The style and capsule that

of *Mentzelia*, to which the natural affinity is undoubted. It is at the same time also distantly related to the genus *Malesherbia*, of South America.

73. Solanum **hirsutum*. Pumilum, piloso-hirsutum, foliis lato-obovatis obtusissimis subintegris basi attenuatis, costa aculeolata, racemis subtrifloris, pedunculis filiformibus.

♃. A remarkably dwarf and profusely creeping rooted species, scarcely a span high, with leaves like the true black oak, sometimes a little sinuated, very slightly prickly along the midrib, racemes about three-flowered, the peduncles long and capillary, and as well as the stem beset with rough yellowish hairs. The flower appears to have been purplish. The calyx very rough.

*Hab.* Discovered by Dr. Boykin, in the vicinity of Milledgeville in Georgia.

74. Conyza **angustifolia*. Herbacea, pulverulento-pubescens, foliis lineari-lanceolatis subdenticulatis acutis basi attenuatis, floribus corymboso-congestis.

*Hab.* In South Carolina, from whence it was received by Mr. Durand. It has the general aspect of C. *Marylandica*, but is at once distinguished by its narrower and almost entire leaves, and the scales of the calyx, which are simply ovate and acute, not terminating in hair-like points.

75. Cantua *_Floridana_. Glabra, foliis pinnatisectis capillaceis, floribus laxe racemosis, corolla tubulosa inferne angustata, limbo corollæ tubo quadruplo breviori, calycibus abbreviatis, laciniis setaceis.

Biennial. Very similar with C. *coronopifolia*, but a more slender plant, with a much shorter calyx and more slender and tubular corolla, with the segments four times shorter than the tube, and cuneate-oblong instead of ovate. In C. *coronopifolia* also, the calyx is nearly half the length of the corolla tube, and the border half its length, presenting a much larger and shorter flower.

*Hab.* For specimens we are indebted to the indefatigable Mr. Ware, who found these in Florida, together with many other plants.

76. Phlox *_Hentzii_. Cæspitosa, pubescens, foliis linearibus lanceolatisve ciliolatis pungentibus, floribus corymboso-glomeratis paucifloris, corollæ laciniis cuneatis obtusis integris, dentibus calycis acutis breviusculis.

4. A cæspitose, showy and common species in the southern pine barrens, with the whole habit and general appearance of P. *subulata*, but producing short leafy stems, the summits of which only are floriferous, and the flowers clustered or aggregated without spreading; the segments of the corolla are also entire and not emarginated, generally white or pale lilac. Sent to the herbarium of the Academy by my friend Mr. Hentz, after whom I have named the species.

77. HYDROPHYLLUM **macrophyllum.* Foliis pinnatifidis inciso grosse dentatis, laciniis subrhomboideo-ovalibus, supremis confluentibus, pedunculo longissimo calycibusque hirsuto, cyma congesta laciniis calycinis brevioribus.

4. A very distinct species allied to H. *Virginicum*, but much more robust, with a very hirsute hairy stem and calyx, and larger and more crowded flowers. The peduncles sometimes seem to support two cymes. The leaves much longer than wide, and none of the segments divided down to the midrib. The divisions about five to seven, the terminal one formed of three confluent ones, the dentures coarse and few. The calyx not nearly divided to its base, and the segments very hairy, shorter and wider than in H. *Virginicum*.

*Hab.* In the forests of Kentucky. Discovered by Dr. Short. Flowers dull white.

### *CHÆTANTHERA.

Calyx parvulus ovatus subimbricatus, squamis subcarinatis. Radiis fœmineis integris (8—12) disco minuto multo longioribus. Receptaculum nudum planum. Semina pubescentia quinque-striata. Pappus duplex, extenus paleis dimidiatis laceris, internus 5—8 setis scabris. Semina ad maturitatem cum calyce patentia.

Plantula parva annua ramosa, foliis integris alternis, flores solitarii terminales. Habitus *Erigeri* et *Asteris*, sed *Bellio* affinis.

78. CHÆTANTHERA *asteroides*. ☉. Strigosely hirsute. The plant small and divaricately branched

from near the base, three to six inches high. The branches setaceous, leafy, one-flowered, the flowers fastigiate. Leaves alternate, spathulate-oblong, entire, obtuse, the upper ones linear. Peduncles very short. The calyx scales nearly equal, lanceolate and very acute, the margins somewhat scariose, the leaves about eight to twelve. Rays pale violet, linear-oblong, eight to twelve, about equal in length with the calyx. The disk yellow, few-flowered, florets five-toothed. Seed subcylindric, pubescent. External pappus mostly one-sided, chaffy, the scales torn. The awns longer than the seed, mostly about five, brownish, and in the mature seed spreading, as well as the calyx.

*Hab.* In Arkansas; in open denudated places, overflowed by winter rains. Flowering in April and May.

79. PHYSALIS **Walteri.* Perennis, pulverulento-subtomentosa, ramosissima, dichotoma, foliis geminis lato-ovatis obtusis longe petiolatis integris, pedunculis solitariis nutantibus, calycibus fructiferis glabriusculis. P. *lanceolata*, Elliott, non Mich.

4. A large and very distinct species with the leaves green, but beneath, as well as the almost terete stem, covered with a pulverulent or microscopic tomentum. The leaves are often almost oval and blunt, though sometimes on the upper part of the stem slightly acute. The fruiting calyx is very large.

*Hab.* In South Carolina.

80. Physalis **angustifolia*. Perennis, glaberrima, prostrata, nana, foliis longissimis linearibus carnosis solitariis, pedunculis nutantibus filiformibus solitariis.

4. A very remarkable dwarf and prostrate species, with many of the leaves three inches long and scarcely a quarter of an inch wide, very smooth and apparently succulent. The calyx large in the flowering stage.

*Hab.* West Florida, probably on the sandy coast. N. A. Ware, Esq.

### *Boykinia.

Calyx 5-fidus, superus, laciniis acutis. Petala 5, calyce multo longioria. Stamina 5, inclusa. Styli 2—3 breves, stigma obtusum. Capsula infera, 2—3 locularis-polysperma. Semina rugosa, minuta.

Herba perennis *Saxifragæ* affinis, sed stamina pauciora et cum *Heuchera* intermedia.

81. Boykinia *aconitifolia*. 4. Smooth. The plant from one to two feet high. The leaves alternate, all except the uppermost, petiolate, dilated and truncated as it were at the base, five to seven lobed, and the divisions incisely serrated, the segments acute (the whole foliage almost exactly that of Aconitum *napellus*.) Petioles rather long, somewhat hairy, the uppermost leaves sessile, the smallest simple. Flowers paniculate, the branches subfastigiate, cymose, the flowers at length somewhat secuned and pedicellate.

The calyx and peduncles viscidly pubescent. Segments of the calyx sublanceolate and acute, five. Petals twice the length of the calyx, oblong, obtuse, unguiculate, white, a little yellowish. Stamens five, not exserted into view, attached with the petals to the sides of the calyx. Styles two or three, short. Stigmas blunt. Capsule almost wholly inferior, two or three celled; the seeds many, and seen through a lens, punctate.

*Hab.* In the valleys of the Alleghany mountains, probably in Virginia or North Carolina, where this curious plant was discovered by the late arduous and eccentric Prussian collector, Mr. Kinn. *v. s.* In Muhlenberg's herbarium, where it was casually referred to Heuchera; its principal affinity, however, is to *Saxifraga;* but besides the defect of five stamens, the habit and structure of the capsule is different, the latter being divided by a permanent dissepiment into two or three cells.

82. CISSAMPELOS **pauciflora.* Herbacea, glaberrima, foliis cordato-ovatis acutis 7—9-nerviis, pedunculis subaxillaribus subbifloris, floribus hermaphroditis.

Of this curious plant, sent from West Florida by Mr. Croom and Mr. H. Loomis, M. D., I have seen but a single specimen, which I was at first inclined to pass over as a mere variety of the DIOSCOREA *villosa.* It is however very distinct even from the genus, both in character and habit. The stem appears erect, the

leaves smooth and thin, cordate-ovate, acute and about seven to nine nerved. The flowers, small and green, are by pairs upon axillary solitary peduncles, their pedicels also long and capillary. The calyx four-parted. Corolla or inner segments none? Stamens four, distinct. The filaments broad and thick; anthers broad and two-lobed. Stigmas three, small.

83. Lupinus **gracilis*. Pilosa hirsuta, foliis digitatis oblongo-linearibus, stipulis filiformibus persistentibus, floribus laxe spicatis alternis, calycis labio superiore emarginato, inferiore integro.

♃. Nearly allied to L. *perennis*, for a variety of which it might be mistaken, but it is more slender, more or less clothed with rough whitish hairs, and with the slender stipules not deciduous. The flowers are generally palish blue.

*Hab.* In Georgia, on the sand hills of the Altamaha.

*Observations on the Tertiary and more recent formations of a portion of the Southern States.* By T. A. CONRAD. Read April 15th, 1834.

EOCENE of LYELL.

I AM indebted to the kind assistance of Judge Tait, of Claiborne, Alabama, for the observations I have made on the strata composing the bluff on which the village is situated. It is difficult to give an exact view of these interesting deposites, as the debris of the diluvium and other strata are heaped promiscuously on the precipitous surface of the bluff, but by following the channel of a small rivulet, scooped out of the yielding rocks, I have been enabled to make a diagram of the strata, which I hope will prove sufficiently correct to be of value to the geologist. I have in my introduction to the "Fossil Shells of the Tertiary Formations," referred the Claiborne depositesto the period of the *London clay* and *Calcaire grossier*, since so happily termed *Eocene*, by Lyell; and I am confirmed in my opinion of the antiquity, at least, of these beds, as they seem to blend, by an admixture of a few species, with the secondary strata of the Cretaceous group. The first notice of the occurrence of the *Eocene* in the United States, as cha-

racterized by its organic remains, I published in this Journal in 1830, from observations I had made in the vicinity of Fort Washington, in Maryland, and I also stated that it occurred at Vance's Ferry on the Santee river, where, I have since learned, that it is covered by a superficial deposite of the fossils of the *Pliocene* period. This interesting information I obtained by the examination of some fossils which belonged to the late Stephen C. Elliott, of Charleston. These were submitted to my inspection by Professor Ravenel, a gentleman who has greatly assisted my researches in South Carolina. One characteristic fossil of the *Eocene* of Claiborne, (*Ostrea sellæformis*, nobis,) occurs at the Eutaw Springs and at Nelson's Ferry, on the Santee river, but they are in a white limestone, associated with very different fossils from those which accompany this *Ostrea* at Claiborne. This limestone, in fact, is doubtless analogous to that on which the Tertiary of Claiborne is based; but its true character is given by my friend Dr. Morton, in his Synopsis, now in press. The *Eocene* commences in Maryland, and extending in a south west direction crops out at intervals in the states of Virginia and North and South Carolina, and is always of very inconsiderable breadth. It meets the Savannah river at Shell bluff, fifteen miles below Augusta; and appears at Silver bluff and other places, occupying a space of about forty miles, following the course of the same river. According to Mr. Vanuxem, Shell bluff is about

"seventy feet high, formed of various beds of impure carbonate of lime, of comminuted shells, and having at its upper part the *Ostrea gigantea?* in a bed nearly six feet in thickness."* This *Ostrea* has certainly been confounded by several writers with two very different shells, *Exogyra costata*, Say, and *Ostrea sellæformis*, nobis. If it occurs in South Carolina at all, it is only in the bluffs of the Savannah river; the only specimens hitherto obtained were from Shell bluff and near Milledgeville, in Georgia, but I believe the species to be identical with a fossil of the *Eocene* at Claiborne. Mr. Finch blends these three very distinct and characteristic fossils to constitute his *Calcaire Ostrée*, which he imagined to be very extensive, but which in reality has no existence as an independent formation.

The *Eocene* probably appears on the Oconee, below Milledgeville, judging from a few fossils which have been sent from that vicinity.† The matrix is calcareous, whitish and very friable. We know nothing of its appearance on Ocmulgee and Flint rivers, but it has been observed in various parts of Early county, and my friend Dr. N. Jones, of Mobile, informs me that he observed it at Fort Gaines, on the Chattahochie, where it constitutes a bluff from one hundred and fifty to two hundred feet in height,

* Journal of the Academy, vol. vi. p. 13.

† The *Scutella quinquefaria* of Say, is very abundant in the vicinity of Milledgeville, Georgia.

which has a close resemblance to that at Claiborne. Its extent on the river is about one mile. At Irwinton, above Fort Gaines, Dr. Jones observed a bluff of still greater altitude, but he is not positive that organic remains occur in it, as he had no opportunity to observe it except from a passing steam boat. He describes it, however, as being similar in general appearance to the bluff at Fort Gaines. The *Eocene* next appears in Wilcox county, Alabama, in the form of a hard dark colored sand stone, containing the characteristic shells, which are not mineralized at all, but are chalky and imperfect. The common corn mills of the county are supplied with stones from this variety of *Eocene*, differing, however, in having its fossils silicified, as they occur in Early county, in Georgia. This formation only extends eight or nine miles along the Alabama river. Claiborne bluff is about one mile in length, and a similar bluff of equal extent occurs three miles below. About three or four miles south of this it terminates in a bluff of less elevation. Here the upper bed is characterized by a concretion of the *Scutella Lyelli*, nobis, in a stratum about three feet in thickness, the matrix of which is a siliceous sand, consisting of angular grains of Quartz. The oxide of iron gives it a highly ferruginous color.

It is remarkable that nearly the whole country in the vicinity of Claiborne is secondary, the *Eocene* having been traced only about one mile east of the village, in the banks of a small creek; and the ridge

dividing the waters of the Alabama and Tombeckbe is of the same secondary character, composed of that limestone characterized by its resemblance to chalk, and full of *Nummulites Mantelli*, Morton. St. Stephens, on the Tombeckbe, is situated on a bluff of the same, about one hundred feet in height; but the *Eocene* appears a short distance north of it, separated from the secondary by a strip of alluvial soil. Here, however, the two upper strata only are visible, the superior bed of limestone being but a few feet in thickness, whilst at Claiborne the corresponding one is about forty-five feet thick. The arenaceous stratum is precisely similar to that of Claiborne, but the fossils are not so well preserved, and are chalky and friable. We know of no locality west of this, in Alabama or Mississippi, of the *Eocene*, but on the Washita river it occurs near the town of Monroe, in company with the Cretaceous group strata, as I have ascertained by means of some fossils sent to the American Philosophical Society, by Judge Bry, to whom science is indebted for some valuable information on the geology of that interesting locality.* The most abundant fossil of the *Eocene* there appears to be *Corbula oniscus*, nobis, a shell very common in the arenaceous stratum at Claiborne. I have not re-

* Some large *Saurien* vertebræ from this place have been erroneously supposed to belong to the *Eocene* period. They doubtless occur only in the *Cretaceous* beds, as Judge Bry informs us that *Ammonites* and other Cretaceous fossils abound in the vicinity.

ceived information of any other localities of the *Eocene*, but doubtless many will be discovered when geology is pursued in a more systematic manner, and with a zeal worthy of its interest and importance. All I have been able to do has been to glean a few facts in a journey much less extensive than I could have wished or intended it to be, under more favorable circumstances. I shall, however, be amply repaid for the fatigues and privations of my journey, if I shall be able to advance one step a knowledge of the geology of our country.

The following diagram will explain the order of succession and the thickness of the strata in Claiborne bluff, and to these I have added the two members of the Cretaceous group, which occur in the vicinity. I have also indicated those species which occur in both formations, and are highly interesting in consequenee, as they furnish indubitable evidence of the antiquity of the Tertiary. I have not detected among nearly three hundred species of shells at Claiborne, any which is identical with a fossil of the *Pliocene* of this country, and *one only is even an analogue;* nor can I refer any one to a recent species, much less to any on the coast of the United States. One only is the analogue to a species of our coast, *Lutraria papyria*, nobis, which resembles L. *canalicalata*, Say, in its general appearance, but is very remarkable in having the umbones turned in a direction opposite to those of the latter species.

## DIAGRAM REPRESENTING THE STRATA COMPOSING THE BLUFF AT CLAIBORNE.

| | thickness | Observations. | Range of certain species | |
|---|---|---|---|---|
| 1. Diluvium | 20 feet | | | |
| 2. Whitish friable limestone. | 45 feet | Contains casts of a few species occurring in the next stratum; the most characteristic fossil is *Scutella Lyelli*; some species of *Anthophyllum* also occur. | *Pecten calvatus*, Morton. | |
| . . . . . | 6 feet<br>. . . . | This portion is indurated, and the fossils occur in casts.<br>. . . . . | . . . . . | |
| 3. Ferruginous siliceous sand | 14 feet | Very friable, and contains about 70 genera and 300 species of shells; among them are *Cardita planicosta*, *Corbis lamellosa*, *Pyramidella terebellata*, of the *Calcaire grossier*; no species apparently existing, and none identical with those of the *Pliocene* of Maryland &c. | | Claiborne Bluff.—Tertiary. Eocene of Lyell. |
| 4. Sand with a calcareous cement | 3 feet<br>. . . . | Concretion of *Ostrea sellæformis*.<br>. . . . . | . . . . . | |
| 5. Soft lead-colored limestone | 70 feet | Contain *O. sellæformis* in abundance, but other fossils are rare; some casts of univalves; a *Pecten*, *Anthophyllum*, *Flustra*, *Turbinolia* &c. Hardly a trace of those species of shells of the strata Nos. 3 and 6. | *Plagiostoma dumosum*, Morton. very rare. | |
| 6. Friable lead colored limestone.<br>Level of the river | thickness unknown | Contains the same class of of shells as stratum No. 3, the the most characteristic fossil, *Cardita planicosta*, a shell very characteristic of the *Eocene*. | | |
| 7. Very white friable limestone | thickness unknown | Contains many casts of shells peculiar to itself; and no other fossil of the next deposite than *Gryphæa vomer*; characteristic fossil *Nummulites Mantelli*, Morton. | *Plagiostoma domosum. Pecten calvatus, Gryphea vomer.* | Near Claiborne. Cretaceous. |
| 8. Bluish limestone, alternating with friable limestone, siliceous sand and marl | 300 feet | The characteristic fossil is *Exogyra costata*. | *Gryphæa vomer.* | |

Lyell observes of the Tertiary order, that "its fossil contents are very dissimilar from those of the secondary rocks; not only *all the species*, but many of the most remarkable animal and vegetable forms being distinct." Yet no geologist, I presume, would venture to consider the Claiborne deposits as of earlier date than the *Eocene period*, or at least as secondary beds, although a species of *Plagiostoma* occurs in them, as well as a few other secondary fossils. They prove doubtless that our *Eocene* is older than that of Europe, and connected by a very interesting admixture of species with both those members of the Cretaceous group, which exist in the vicinity of Claiborne.

If the deposite at Fort Washington, Maryland, be correctly referred to the *Eocene*, it must be a newer member of that formation than Claiborne bluff, inasmuch as the species are generally distinct, and no secondary fossil occurs amongst them. The only recent species is *Venus mercenaria*, Lam.; and one of the most characteristic shells, *Ostrea compressirostra*, Say, is found in the *Pliocene* on James river, Virginia, but is rare in that locality. Perhaps the deposite at Fort Washington will be found to be of so recent a character as to be compared with those in Europe of the *Miocene period*.

## Pliocene of Lyell.

The fossils of the *Pliocene* have not been found south of Vance's ferry, on the Santee river, nor do I believe it occurs in Georgia, Alabama or Mississippi; I never observed it in any part of South Carolina, although I explored the country between Charleston and the Eutaw springs, which is wholly secondary. The deposite therefore at Vance's ferry is probably very limited in extent and extremely superficial, capping the cretaceous rocks in the same manner as at Wilmington, North Carolina, where a patch only a few feet thick reposes on the zoophytic secondary rocks. The *Pliocene* probably occurs on the Santee river, near to the junction of the Congaree and Wateree rivers, as Mr. Say describes two species of *Arca*, evidently *Pliocene* fossils, from a locality near the junction of these two rivers.

It may be of sufficient importance to give a list of those species of the *Pliocene*, which are also inhabitants of the coast of the United States. They are the following species, so far as my observation has extended:—*Arca transversa*, Say; *Cytherea Sayana*,* nobis; *Pholas costata*, Lam., *Ostrea Virginiana*, Gmel.; *Solen ensis*, Lin.; *Saxicava rugosa*, Lam.; *Venus mercenaria*, Lam.; *Panopea reflexa*,† Say;

* *C. convea*, Say.

† I found a recent valve at Mobile Point. It is doubtful whether this shell is distinct from *P. Faujasii*.

*Mactra tellinoides*, nobis; *Pandora trilineata*, Say; *Cardita tridentata*, Say; *Lucina contracta*, Say; *L. crenulata*, nobis; *L. divaricata*, Lam.; *Crepidulata convexa*, Say: *C. glauca*, Say; *C. plana*, Say; *Fusus cinereus*, Say; *Nassa trivittata*, Say; *N. lunata*, Say; *Natica duplicata*, Say; *N. heros*, Say; *Fulgur carica*, Say; *F. canaliculatus*, Say; *Scalaria clathrus*, Lam.; *Vermetus lumbricalis*, Lam.

I have not in the foregoing list enumerated those species which are found fossil only in the *Newer Pliocene*, on the Potomac; but enough have been given to show the recent character of the deposites in question, especially when it is remembered that all which I have enumerated, twenty-nine species, still live upon the coasts of the middle and eastern states.

Of the *Newer Pliocene*, I have seen no other example than the locality above mentioned, unless those vast beds of *Rangia cyrenoides*,* which border the Gulf of Mexico be referred to that period. I consider them however, to be of more recent date, inasmuch as some memorials of the human race have been found among them, consisting of small images, idols probably of a people who have passed away without leaving even a trace of their history behind them, in

* I have named this shell *Clathradon cuneata*, in Silliman's Journal, on the authority of an *unpublished* manuscript by Mr. Gray. I have since been informed that Des Moulins has *published* the genus and species by the name of *Rangia cyrenoides*.

the uncertain and twilight obscurity of tradition. Formations like that in question are local, and cannot be considered as actually contemporaneous with any others, although they must be of comparatively recent date. A convulsion not more violent than has been known to agitate the valley of the Mississippi, might suffice to elevate the flats of Mobile bay above the reach of tide water, and in consequence they would soon be clothed with vegetation, the decay and reproduction of which would gradually prepare the soil for a future forest of pines. The same convulsion may have elevated the productive soil of the Tennessee valley, confining the river within narrow bounds. In this way we can account for the deposites of fresh water shells which occur there, as no inundation now carries the *Naiades* over the low lands which are annually submerged.

## Recent Formations.

No deposites of fresh water shells have been discovered in this country, of a more ancient date than what has been generally termed *Alluvial*, as they only occur on the bottom lands which margin the rivers in the southern states, and consist of species inhabiting the neighboring streams. It is a general opinion that such deposites of shells have been made by the Indians, who procured them for the luxury supplied by the muscles; but it is quite evident to a geologist that they are the historians of ancient alter-

ations in the courses of various rivers. They are, it is said, very extensive in Georgia, and I have observed them scattered in various places throughout the Tennessee valley. A more interesting alluvial deposite borders the Gulf of Mexico, and is probably several hundred miles in extent. It consists entirely of two species of shells, *Cyrena Carolinensis* and *Rangia cyrenoides*, Des Moulins; the former, however, is rare; the deposite consisting almost entirely of the latter shell. In the vicinity of Mobile, which is built on a sandy flat, very little elevated above tide water, the beds in question are superficial, although covered by a vegetable mould bearing a forest of gigantic pines; when one of the trees is prostrated by the wind, the decomposing shells are seen adhering to the roots, but beneath they are entire, and nearly as hard when dry as the recent species. It is remarkable that they occur in beds with scarcely any admixture of sand or earth, and they are consequently found extremely useful in repairing roads and paving the streets of the city, where, when pulverized, they form a kind of McAdamized road. It is supposed that they have added much to the health, as they certainly have to the comfort of the inhabitants. Scarcely a yard or garden is without a pavement formed of these shells, which are nearly as perfect as the recent species. They are dug from the surface of the soil, both on the main shore and the islands of the bay, and I have been assured that numerous *small*

*images* have been frequently found among them. These deposites border the bays of the Gulf of Mexico, between Mobile and New Orleans, and they occur in the vicinity of Franklin, Louisiana. The Chandelleur isles, between Mobile bay and the delta of the Mississippi consist of deposites of these shells covered by a fertile soil. The *Rangia* lives in vast numbers in the extensive flats below Mobile, burrowing three or four inches beneath the surface of the sand, in which numerous depressions indicate where they are to be found. These flats are exposed at low tide, covered with a vast quantity of drift wood, brought down the Mobile river by freshets in the Alabama and Tombeckbe. The decomposition of this wood and the yearly accumulation of the washings of alluvial soils, are rapidly forming a mould which in course of time will doubtless give birth to a forest of pines. Much of the wooded land in the vicinity of Mobile has evidently been formed under parallel circumstances, and grass and other vegetables are rapidly invading the barren territories of the living *Rangia cyrenoides.*

An extensive deposite, consisting of an aggregate of broken shells is still rapidly forming on the coast of East Florida. Anastatia island is wholly composed of those species of shells which abound in a recent state on the Florida coast.* They are generally commi-

* See Mr. Diebz' paper, vol. 4, p. 78.

united, having evidently been subjected to the action of the surf. Occasional masses, however, are seen where the fragments are very large, and entire valves of a large size are abundantly intermixed. Is it not probable that Anastatia island is based on coral, the growth of which has contributed to its present elevation above the level of the sea? If this should prove to be the fact, I could scarcely doubt that a great portion of the peninsula of Florida had been elevated by the same means. In the vast recesses of ocean the coral insect is doubtless forming immense structures, which at a future period will be the foundation of islands to be clothed with vegetation and inhabited by man.

Such has been the origin of the Tortugas, and those numerous small islands which it is reasonable to suppose will one day be united to the peninsula of Florida.

# APPENDIX.

## *Descriptions of new Tertiary Fossils from the Southern States.* By T. A. CONRAD.

### ANATINA.

A. *antiqua.* Shell ovate, rather elevated, convex, thin and fragile; with obsolete concentric sulci; beaks slightly prominent; fosset not oblique, elongated. Length, two inches; height, about one and a half inches.

*Locality.* Yorktown, Va.

### SAXICAVA.

S. *pectorosa.* Shell ovate, inflated; with radiating prominent striæ, cancellated by concentric lines; umbones obtusely rounded; posterior side slightly produced, obtusely pointed; hinge edentulous; cavity very capacious.

*Locality.* Suffolk, Va.

### PANDORA.

P. *arenosa.* Shell elliptical; obtusely pointed behind; dorsal margin rectilinear, with a submarginal raised line passing from the beak to the extremity;

anterior side short, margin rounded. Length two-thirds of an inch.

*Locality.* Yorktown, Va.

I found several specimens of this species, but they consisted of the left valve only. Compared with P. *trilineata* of Say, it is more elliptical, smaller and the teeth are remarkably small. It has no pearly appearance whatever.

### Tellina.

T. *declivis.* Shell somewhat elliptical, with the anterior side short, and the margin obliquely truncacated; posterior end regularly rounded; beaks hardly prominent; lateral teeth distinct.

*Locality.* Yorktown, Va.

It resembles in outline the *Amphidesma subreflexa*, nobis; and might, viewing the exterior only, be mistaken for that shell.

T. *egena.* Shell subtriangular, convex, with fine crowded concentric lines and obscure radiating striæ; anterior margin oblique, rectilinear; extremity subangulated; dorsal margin but little arcuated; lateral teeth none. Length, two and a half inches.

*Locality.* James river, Va.

This shell resembles in outline T. *acuta*, Wood's Index Test. pl. 3, fig. 25. It is not so pointed posteriorly.

*Tellina scandula.* Shell ovate, much compressed; anterior slope arcuated; extremity truncated; fold nearly terminal, subcarinated; beaks not prominent, subcentral, nearest the posterior end. Length two inches; height, one inch and three-eighths.

*Locality.* Claiborne, Alabama.

CYTHEREA.

C. *reposta.* Shell large, ovate, moderately thick, and convex; beaks prominent; dorsal margin depressed, slightly arcuated; posterior extremity obtusely rounded; lunule large, lanceolate, defined by a slightly impressed line; two anterior cardinal teeth united above; posterior cardinal tooth laminar, slightly prominent; anterior tooth thick, subpyramidal. Length five inches; height, three inches and three quarters.

*Locality.* Suffolk, Va.

C. *pandata.* Shell elliptical, compressed; with the basal margin slightly swelling in the centre; beaks about one third the length of the shell nearest the anterior end, slightly prominent; lunule ovate acute, concave, slightly impressed. Length about one inch.

*Locality.* Yorktown, Va.

C. *obovata.* Shell longitudinally subobovate, with regular concentric impressed lines; beaks very pro-

minent, not central; anterior tooth situated very near the termination of the anterior cardinal tooth; cavity of the umbo capacious. Height, one-third of an inch.

*Locality.* Suffolk, Va.

### Amphidesma.

A. *subreflexa.* Shell somewhat elliptical, convex, anterior margin descending very obliquely and nearly rectilinearly from the beak; extremity subreflected, obtusely pointed; posterior side elongated, margin rounded; anterior basal margin oblique, and nearly parallel with the dorsal margin. Length half an inch.

*Locality.* Same as the preceding.

### Astarte.

A. *lunulata.* Shell small, triangular, compressed, with about thirteen acute concentric prominent lines; anterior slope rectilinear, angular at the extremity; basal margin rounded; beaks central, apex acute; lunule much elongated. Length and height nearly equal, about one fourth of an inch.

*Locality.* Suffolk, Virginia.

A. *concentrica.* Shell subtriangular, compressed, with numerous concentric rounded costæ, crowded on the basal margin; umbones slightly flattened; apex acute, central; lunule large, concave, lanceolate; posterior margin concave; submargin acutely

angular, straight; extremity obtusely rounded; cardinal teeth strongly striated; margin crenulated. Length, one inch and one-eighth; height, seven-eighths of an inch.

*Locality.* Yorktown, Va.

A. *symmetrica.* Shell subtriangular, convex, with concentric impressed lines or undulations; anterior, posterior and basal margins regularly rounded; apex rather prominent, acute, nearly central; lunule concave, ovate-acute; cardinal teeth very prominent, striated; margin crenulated. Length three quarters of an inch; height rather less.

*Locality.* Yorktown, Va.

This species may be distinguished from A. *vicina*, Say, by the lunule, which is much less excavated, and the shell is also less convex than in the latter species.

PECTUNCULUS.

*Pectunculus perplanus.* Shell suboval, much compressed; with radiating striæ; anterior and posterior margins wide and obtusely rounded or subtruncated; beaks central, not prominent; series of cardinal teeth nearly interrupted by an oblique fosset; margin entire. Length more than half an inch.

*Locality.* Claiborne, Alabama.

BALANUS.

*B. proteus.* Shell subconical, with strong promi-

nent ribs, varying from one to three on each valve; aperture ovate. Length, two inches; height, one and a half inch.

*Localities.* James river, Suffolk; Yorktown, Va.

A very common species, modified in form by whatever surface it may be attached to; it is either ribbed, striated or rugose; on a plain surface it is smooth, with a few strong ribs. I have a specimen on one valve of which is a miniature resemblance of the entire valve of a Pecten to which the Balanus is attached.

### FASCIOLARIA.

F. *mutabilis.* Shell fusiform; spire conical with the whorls slightly contracted above, and the convex portion with longitudinal undulations, becoming obsolete in old shells; apex somewhat papillated; labrum arcuated; columella with two very oblique not much elevated folds, sometimes obsolete; beak slightly recurved; aperture more than two thirds the length of the shell. Length about four inches.

*Locality.* St. Mary's river, Maryland.

I formerly considered this shell to be identical with *Voluta Lamberti*, Sowerby, but I have long been aware that is not only distinct, but a true FASCIOLARIA, whilst the *Lamberti* is doubtless a *Voluta*, judging from Sowerby's figure. Old specimens have the beak shortened, but young shells have it much produced.

TURBINELLA.

T. *demissa.* Shell fusiform, with very obscure spiral striæ; whorls slightly contracted above, the convex part having obscure longitudinal undulations; suture impressed; spire elevated; columella with three profound thickened plaits; the superior one shortest and most thickened; beak produced, recurved. Length, two and a half inches.

*Locality.* Choptank river, Md.

CANCELLARIA.

C. *perspectiva.* Shell subglobose, with irregular oblique prominent distant ribs, and obtuse prominent spiral lines, alternated in size; spire very short, conical; whorls profoundly channelled above; aperture obovate, rather more than half the length of the shell; labrum striated within; columella with three compressed plaits; the superior one very prominent; umbilicus wide, striated within; exhibiting the volutions to the apex. Length, less than one inch.

*Locality.* James river, Va.

C. *plagiostoma.* Shell short subfusiform, with numerous longitudinal ribs and distant obtuse spiral lines; summits of the whorls flattened; shoulder angulated; spire short, the two terminal volutions smooth; apex somewhat papilliform; labrum with dentiform striæ within; columella with three plaits;

the superior one very prominent, aperture about two-thirds the length of the shell; base subrostrated, twisted, with a small umbilicus.

*Locality.* Same as the preceding.

TROCHUS.

T. *Mitchelli.* Shell conico-pyramidal, with four prominent crenulated striæ on each whorl; the inferior striæ most prominent, on which the crenulations are subacute, whilst on the others they are beaded; between each of the striæ is a smooth spiral line; base with about seven smooth prominent obtusely rounded lines; aperture subquadrangular. Length, nearly one inch.

*Locality.* Same as the preceding.

T. *bellus.* Shell conical, with prominent beaded spiral striæ; whorls slightly contracted above; periphery rounded: base with about eight large beaded elevated spiral striæ. Length half an inch.

*Locality.* James river, Va.

This species resembles the *Mitchelli,* but can at once be distinguished by the beaded striæ on the base.

T. *philanthropus.* Shell subconical, with the whorls slightly angular near their base; and with prominent spiral beaded lines, alternating in size;

striæ on the base nearly smooth, not crenulated; subumbilicated; aperture obliquely quadrangular.

*Locality.* Same as the preceding.

This species can be distinguished by its groove behind the columella from the other species herein described.

T. *labrosus.* Shell short subconical, spirally striated, summits of the whorls deeply channelled; channel margined by a prominent obtuse line; two terminal volutions smooth; periphery channelled; channel margined on both sides by an obtuse line; base strongly grooved.

*Locality.* Same as the preceding.

T. *lapidosus.* Shell short subconical, with rectilinear sides; spiral striæ crowded and obsolete; lines of growth distinct; suture impressed; periphery angulated; base flattened, finely striated; umbilicus small, profound, aperture subovate.

*Locality.* Same as the preceding.

This species is allied to T. *humilis,* nobis.

PLEUROTOMA.

P. *Virginiana.* Shell subulate, with about nine volutions, with longitudinal, oblique ribs, which are separated above from the suture by a slight contraction of the whorls, which is carinated; spiral raised lines minute, but distinct and crowded; columella

rectilinear, a little oblique; sinus of the labrum not profound; beak very short; aperture elliptical, about one third the length of the shell. Length, three-fourths of an inch.

*Locality.* James river, near Smithfield, Va.

P. *pyrenoides.* Shell subulate, turrited, with short oblique, very prominent longitudinal ribs, separated above from the suture by a contraction of the whorls; suture margined by a slightly prominent obtuse line; spiral lines fine on the contraction, but coarser over the ribs and intervening spaces, very prominent and rather distant on the body whorl, with indistinct intermediate lines; sinus of the labrum profound; beak very short and straight; aperture about one of the length of the shell. Length, one inch.

*Locality.* Same as the preceding.

P. *tricatenaria.* Shell subulate, turrited, with longitudinal undulations, which on each whorl of the spire are crossed by three equidistant prominent spiral lines; whorls indented above; indentations finely striated; suture margined by a carinated line; body whorl with about thirteen spiral lines; aperture more than one-third the length of the shell. Length, three-fourths of an inch.

*Locality.* Same as the preceding.

This species resembles the last, but is distinguished by the catenated appearance of the whorls.

P. *biscatenaria*, Syn.; P. *catenata*, nobis, Journal of the Academy, vol. vi. p. 223, pl. 9, fig. 13.

P. *incilifera*, Syn.; P. *gracilis*, nobis, pl. 9, fig. 10.

I change the names of these two shells, as that of the former is preoccupied by Lamarck, and the *Murex gracilis*, of Brander, having been referred to Pleurotoma, it is necessary also to change the name of the latter species.

### Turbo.

T. *caperatus*. Shell obovate ventricose, with about five convex whorls, with fine prominent striæ, alternated in size, and crossed by oblique crowded minute wrinkled lines; suture impressed; aperture half the length of the shell, orbicular; columella slightly swelling near the centre. Length, one-third of an inch.

*Locality*. Suffolk, Va.

### Marginella.

M. *limatula*. Shell ovate, polished; spire very short; labrum denticulated on the inner margin; margin swelling in the centre; aperture contracted above; columella with four oblique elevated plaits. Length, more than half an inch.

*Locality*. Same as the preceding.

M. *eburneola.* Shell subfusiform, highly polished; spire elevated; aperture more than half the length of the shell; labrum denticulated within; columella with four elevated plaits.

*Locality.* Same as the preceding.

This shell is allied to M. *eburnea,* Lam.

SOLARIUM.

S. *nuperum.* Shell discoidal, with spiral crenulated lines; that which crowns the whorls largest; suture deeply channelled; umbilicus moderate; base convex, with crenulated lines; aperture suborbicular. Length one-third of an inch.

*Locality.* Same as the preceding.

This is the only species of Solarium, with the exception of S. *cancellatum,* nobis, yet discovered in the *Pliocene* of this country, whilst in the *Eocene* at Claiborne, I found eight species.

DELPHINULA.

D. *lyra.* Shell transversely subovate; spire depressed; body whorl with about eight distant very elevated ribs, composed of double laminæ; space between the ribs transversely striated; umbilicus small, placed nearer the summit than the base of the shell; aperture dilated; longitudinally suboval. Length, less than half an inch.

*Locality.* Suffolk, Va.

The only tertiary species yet discovered in the United States, and one of the most remarkable shells I have found.

### Acteon.

A. *novellus.* Shell subcylindrical, very small, with minute crowded impressed spiral lines; columella with an obtuse, not very prominent fold.

*Locality.* Suffolk, Va.

This species differs in its striæ from all our other species; these are more minute and crowded.

### Dentalium.

D. *thallus.* Shell slightly curved, smooth, highly polished; swelling below the middle; aperture very regularly oval.

*Locality.* Suffolk, Va.

It resembles D. *gadus,* but is more gradually contracted towards the base. Length, nearly half an inch.

### Fissurella.

F. *alticosta.* Shell ovate, elevated, cancellated, with about seventeen elevated ribs and intermediate prominent striæ; the middle one largest; apex inclined, not nearly central; fissure regularly oval.

Allied to F. *græca,* Lam. From the *Pliocene* of Maryland.

This is the analogue of F. *græca*, with which species I formerly confounded it.

F. *Griscomi*. Shell ovate-oval, compressed, rather elevated, cancellated; radiating ribs crowded, somewhat alternated in size; fissure oblong, inclined, nearest to the anterior end; within somewhat thickened on the margin which is crenulated; an impressed submarginal line.

*Locality*. Stow creek, Salem county, New Jersey.

I have named this pretty species in honor of my friend Samuel Griscom, who first discovered the *Pliocene* in New Jersey.

INFUNDIBULUM.

I. *gyrinum*. Shell transversely suboval, with about four volutions, those of the spire very convex, spire oblique; body whorl large and convex. Length, half an inch.

*Locality*. Same as the preceding.

CAPULUS, Mont.

C. *lugubris*. Shell irregular, suboval, depressed, laminated; with radiating crenulated striæ; apex slightly prominent; nearly terminal. Length, half an inch.

*Locality*. Same as the preceding.

A remarkable shell, of a dark horn color; it occasionally, however, assumes the color and appearance of the accompanying fossils.

### Turritella.

T. *alticostata.* Shell much elongated, subulate, whorls twelve to fourteen, each profoundly carinated near the base, and with prominent spiral striæ.

*Localities.* James river, Va.; Choptank river, Md.

T. *octonaria.* Shell with regular convex volutions, with about eight prominent spiral striæ, and fine intermediate ones on each whorl.

Var. A. with the whorls subcarinated in the middle.

*Locality.* Choptank river, Md.

### Fusus.

F. *sexangulus.* Shell short fusiform, with six profoundly elevated longitudiual ribs on each whorl; and with fine spiral striæ; costæ somewhat foliaceous. Length, one inch.

*Locality.* Claiborne, Alabama.

F. *raphanoides.* Shell fusiform, entire; whorls of the spire obliquely flattened above; suture profoundly impressed; body whorl large, convex, abruptly rounded beneath; aperture not expanded,

suddenly contracted near the summit and on the beak; beak long, straight. Length two inches and two-thirds.

*Locality.* Claiborne.

F. *salebrosus.* Shell fusiform, elongated; spire and beak of nearly equal length; whorls concave above, and armed below the middle with obtuse prominent nodes; spiral striæ fine and prominent; body whorl suddenly contracted at base; beak slightly sinuous. Length, two inches.

*Locality.* Claiborne, Alabama.

F. *irrasus.* Shell short fusiform, ventricose; beak and spire nearly equal in length; with longitudinal costæ, ten on the body whorl, and numerous prominent spiral striæ; summit of the whorls flattened; broadly but not profoundly channelled near the suture; suture not impressed. Length, one inch.

*Locality.* Claiborne, Alabama.

This shell is allied to F. *stamineus*, nobis, but may be distinguished by its more numerous spiral striæ, and by the channel on the summit of the whorls.

CASSIS.

C. *Taitii.* Shell suboval, with about eight series of prominent nodes on the body whorl; summit of the whorls flattened, and with a prominent line near

the suture; intervals between the costæ with a few spiral striæ; apex slightly papillated; labrum widely reflected, dentate on the inner margin; labium with three or four prominent striæ at base. Length, one inch and three-fourths; breadth, one inch and one-fourth.

*Locality.* Claiborne, Alabama.

I dedicate this beautiful species to my kind friend Judge Tait, of Claiborne, whose love of science first brought into notice the rich deposites of fossils near the town in which he resides.

C. *brevicostatus.* Shell elliptical; volutions indented above, and with narrow oblique tuberculated costæ, which on the body whorl abruptly terminate above the middle; spiral striæ fine, lines of growth prominent; labium thickened; margin subacute; within with short prominent striæ; labium striated above and beneath. Length, three-fourths of an inch.

*Locality.* Claiborne, Alabama.

Allied to C. *nuperus,* nobis.

PROTO.

P. *vetusta.* Syn. *Melania vetusta,* nobis. Fossil Shells, No. 3, p. 35.

*Cerithium striatum,* Lea, Con. to Geology, p. 131, pl. 4, fig. 122.

This is a true *Proto* of Defrance, but as the labrum

is extremely thin, it is seldom perfect enough to exhibit its generic character.

### Cerithium.

C. *solitarium.* Shell subulate, volutions nine or ten, not convex, and each with four nodulous spiral lines.

*Locality.* Claiborne, Alabama.

Two or three specimens of this species, and a single fragment of another, are all of this genus I could find at Claiborne; and this is remarkable, when we consider the vast number of species which occur in the older tertiary deposites of Europe.

Mr. Lyell observes that the living testacea of this genus inhabit the sea near the mouths of rivers, where the waters are brackish, and that the Paris basin which contains no less than one hundred and thirty-seven species, was probably originally a bay of the sea. Now the very rare occurrence of Cerithea, or of any other genera which are partial to brackish water, would induce us to conclude that the Eocene of Claiborne was deposited, not in a bay or arm of the sea, but in the depth of the ancient ocean.

### Ancillaria.

A. *tenera.* Shell thin; spire turrited; whorls plicated on the angle, and on the shoulder of the body whorl; lines of growth distinct; aperture large,

patulous, two-thirds of the length of the shell; columella much arcuated. Length, one inch and one fourth.

*Locality.* Claiborne, Alabama.

Allied to A. *scamba,* nobis, but is thinner, has a much larger aperture and less elevated spire; it has but little deposit on the columella. I found only one specimen.

### Fusus.

F. *Cooperi.* Shell fusiform, thick, ventricose; spirally striated, with very prominent longitudinal undulations which terminate above the middle of the body whorl; whorls flattened or concave above; suture of the body whorl margined by an obtuse line; beak broad, subumbilicated at the base. Length, one inch and three-fourths; breadth, nearly one inch.

*Locality.* Claiborne, Alabama.

I dedicate this species with pleasure to one of our ablest naturalists, William Cooper, Esq., of New York.

### Crepidula.

C. *dumosa.* Shell convex, with longitudinal costæ alternating in size, the larger ones armed with short erect spines; beak laterally curved, subspiral. Length, seven-eighths of an inch.

*Locality.* Claiborne, Alabama.

This interesting species is related to C. *lirata*, nobis, (C. *cornu-arietis*, Lea,) but differs in having spines and larger costæ; the beak is more curved, though not so prominent. It also resembles C. *costata*, Morton, but the spines are more slender, and not so distinctly foliated; and the ribs are far more prominent. I found only one specimen of this species, whilst the C. *lirata* is vastly abundant and very perfect in the same locality.

### Serpula.

S. *squamulosa*. Shell irregularly sinuous, with numerous vaulted septæ and prominent longitudinal ribs which are armed with minute scales.

*Locality*. Claiborne, Alabama.

A beautiful and rare species; the diameter about one-eighth of an inch. I have two specimens in which apparently several individuals are twisted together. It seems to differ from other species of this genus in having *septæ* like those of the *Siliquaria vitis*, nobis.

### Cytherea.

C. *Nuttali*. Shell subcordate, ventricose, with crowded elevated acute concentric lines on the inferior portion, obsolete above; beaks prominent; lunule cordate, merely defined by an obscure impressed line; cavity of the umbo capacious.

*Locality.* Claiborne, Alabama.

This species resembles C. *Poulsoni*, nobis, (C. *globosa*, Lea,) but differs in its striæ and in the beaks which are not so greatly curved forwards. It is smaller than the Poulsoni. I dedicate it to Nuttal, the distinguished naturalist.

C. *Mortoni.* Shell ovate, convex, with numerous regular impressed lines; lunule cordate, defined by an impressed line. Length, two inches; height, one and a half inches.

*Locality.* Claiborne, Alabama.

Allied to C. *æquorea*, nobis, (C. *Hydii*, Lea,) but is a much larger species, with more regular sulci. It is not uncommon at Claiborne, and I could readily distinguish it from C. *æquorea* in every stage of growth. I give it the name of my friend Dr. S. G. Morton, through whose kind assistance I was enabled to visit the most remarkable tertiary deposites in the southern states.

ASTARTE.

A. *obruta.* Shell triangular, convex, smooth, with a few obsolete undulations; beaks prominent, sulcated, margin crenulated. Length, one inch; height, seven-eighths of an inch.

*Locality.* Choptank river, Md.

Allied to A. *undulata*, Say, but is more convex,

and not profoundly undulated; the umbo is not flattened.

PECTEN.

P. *Rogersii.* Shell ovate, compressed, with four very large and broad convex ribs and numerous radiating lines; ears small. Length and height, one inch and one-eighth.

*Locality.* James river, Va.

It is with pleasure I dedicate this remarkable species to my friend Henry D. Rogers, the able geologist.

P. *decemnarius.* Shell ovate, slightly convex, with about ten broad flattened ribs, disappearing on the umbo, some of them sulcated; radiating striæ numerous, distinct, subscabrous; ears unequal.

*Locality.* Same as the preceding.

I possess but a single superior valve of each of these Pectens.

LEPTON? Turton.

L. *mactroides.* Shell triangular, subequilateral, thin, convex, smooth and polished; beaks prominent; central; basal margin straight; posterior extremity less obtusely rounded than the anterior. Length, less than half an inch.

*Locality.* Choptank river, Md.

Allied to a recent shell on the eastern coast which I have called *Lepton fabagella*, a single specimen of which was kindly lent me by Col. Joseph G. Totten, of Newport, but has unfortunately been mislaid; from a drawing of it, it appears to have been much shorter than the fossil species, and was of a suborbicular form.

### Tellina.

T. *biplicata*. Shell suboval, inequivalve, slightly ventricose, with obscure radiating lines, and prominent filiform striæ, much elevated over the folds of the posterior side; folds two, one on each valve angular; cardinal teeth two in the right valve, much compressed, posterior one profoundly bifid; one similar bifid tooth in the opposite valve; hinge margin profoundly sulcated posteriorly; lateral teeth none. Length, one inch and a half.

*Locality*. Choptank river, Md.

This species much resembles in general appearance the T. *intastriata*, Say, a recent species on our coast, but it is readily distinguished by the arrangement of the hinge and other characters.

### Scutella.

S. *Lyelli*. Suborbicular, much compressed on the margin, and very convex in the centre; ambulacra five; beneath flat, or slightly concave near

the margin, with five radiating impressed lines, each of which near the middle has lateral branches; one or two obscure intermediate lines. Diameter nearly three inches; height half an inch.

This fossil is very characteristic of the upper stratum of the *Eocene*, and occurs in vast abundance a few miles south of Claiborne, on the Alabama river; at Claiborne it is rather rare; it occurs, however, in every stratum of the *Eocene*, but a very few fragments only have been obtained in any but the upper portion of this formation.

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## CONCLUDING OBSERVATIONS.

Since the list of species which occur, both recent and fossil, was printed, I have examined some Pliocene shells sent from North Carolina by Professor Elisha Mitchell, and among these I detected several more which exist on the coasts of the middle and southern states. These are *Amphidesma inequale*, Say; *Arthemis concentrica*, *Anomia ephippium*, Lin.; *Cytherea gigantea*, Lam.; *Lutraria canaliculata*, Say; *Mactra lateralis*, Say; *Corbula contracta*, Say; *Oliva litterata*, Lam.; *O. zonalis*, Lam. To these may be added *Pecten Magellanicus*, Lam., a single valve of which is in possession of my friend Henry D. Rogers, and was found in Virginia. *Cerithium dislocatum*, Say, also occurs in Virginia,

near Suffolk. This gives about forty recent, and one hundred shells supposed to be extinct in the Tertiary deposits of New Jersey, Maryland, Virginia and North Carolina, to all of which many extinct species are common, but the deposits of North Carolina appear to contain the largest proportion of existing species.

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## APPENDIX.

### Murex.

M. *Mantelli.* Shell subfusiform; body whorl inflated; with six angular varices, crossed by prominent equidistant lines, expanding on the varices, and terminating in very short, foliated, obtuse spines: between the lines is a fine stria; fine longitudinal striæ passing over the spiral lines; spire short; aperture ovate; channel nearly closed; beak larger than the spire, reflected. Length, one inch.

*Locality.* Claiborne, Alabama.

M. *septemnarius.* Shell short, subfusiform, with seven varices, and prominent spiral subscabrous striæ, with a fine line between; shoulder with prominent, acute, foliated spines; whorls angular, densely striated above; spire rather longer than the beak, which is reflected; labrum thickened within; with a few short, prominent lines near the margin; margin slightly

waved; aperture small, subovate; canal open. Length, one inch.

*Locality.* Claiborne, Alabama.

### Cancellaria.

C. *alternata.* Shell short subfusiform; whorls six, with nine or ten thick longitudinal oblique costæ, with prominent spiral and finer intermediate striæ; spire subconical; aperture less than half the length of the shell; labium with three plaits, decreasing in size inferiorly, as in Mitra; aperture semilunar. Length, half an inch.

*Locality.* Choptank river, Md.

### Fusus.

F. *symmetricus.* Shell fusiform; spire and beak nearly equal in length; whorls seven, rounded, with crowded very regular striæ; suture deeply impressed; two or three volutions near the apex longitudinally ribbed; labrum with a broad not much prominent varix on the exterior margin; beak slender, sinuous. Length, three-fourths of an inch.

*Locality.* Claiborne, Alabama.

A beautiful species; one of the most symmetrical of the genus, and so rare that I procured but one specimen.

CERITHIUM.

C. *nassula.* Shell subulate, whorls about thirteen, cancellated; longitudinal and spiral lines equal, crossing at right angles, forming square, smooth and concave intervening spaces; spiral lines three on each whorl; suture margined by a prominent line; sutural space indented; labium reflected, forming a groove behind it. Length, one inch and one-eighth.

*Locality.* Claiborne, Alabama. One specimen only was discovered.

TEREBRA.

T. *polygyra.* Shell subulate; sides of the whorls perfectly rectilinear, angular near the suture, angle crenulated, beneath which is an impressed spiral line; whorls near the apex longitudinally striated. Length, one inch and one-eighth.

*Locality.* Claiborne, Alabama.

OSTREA.

O. *Georgiana.* Shell thick, elongated, straight; hinge much produced; upper valve nearly flat.

*Localities.* Orangeburgh, South Carolina, Shell Bluff, and near Milledgeville, Georgia.

This species is found twenty-two inches in length, and is remarkable for the great length and depth of the cardinal fosset.

I supposed this shell to be identical with O. *Alabamensis*, of Lea, but having recently examined many specimens, I am convinced it is distinct. De France notices the species, but gives it no name. It is extensively quarried, to be converted into lime, in those districts where it abounds. At Shell Bluff it constitutes a distinct stratum, the upper portion of the Eocene, and was referred to O. *gigantea?* by Mr. Vanuxem.

*Analysis of some of the Coals of Pennsylvania.* By H. D. ROGERS, F. G. S., London, and A. D. BACHE, Professor of Natural Philosophy and Chemistry in the University of Pennsylvania.

Read June 17, 1834.

THE following experiments are part of a series undertaken with a view to ascertain the proportion of earthy and incombustible residuum in the various coals, the chemical nature of that residuum, and any influence which this may exert, useful or injurious, on the employment of this valuable mineral for domestic consumption, or in the arts.

We had meant likewise to ascertain by direct experiment, the quantity of carbon, together with whatever gases and volatile substances may occur with it; all of these being in the present experiments consumed and dissipated. This being a somewhat separate branch of inquiry, we have reserved it for another occasion, when we hope also to extend the present series upon the incombustible parts of the coal, to specimens from districts not here embraced.

The coals principally experimented on were specimens from the various seams of the anthracite mines

on the Little Schuylkill, called the Tamaqua mines; and secondly, one variety of the bituminous coal of Lycoming county.

The Tamaqua coal was selected for our first essay, as coming from a position intermediate between the hard Lehigh at one extremity of the coal region, and the softer Pottsville coal towards the other, and as affording moreover a great diversity of character in the different veins and specimens.

No general mineralogical description can with any justice be applied to the coal of this district, or indeed with accuracy to all portions of the same vein or seam, as its external features, and of course its purity and exact chemical composition are found incessantly to vary. We prefer therefore describing each specimen from which an analysis was made, individually, not meaning, however, that one description should apply to all the coal from the same vein. It is true, however, that certain characters predominate in a given vein.

The order in which the examination was conducted, was to ascertain—

1st. The quantity of water and other volatile matter mechanically present in the coal.

2d. The proportion of incombustible matter or ashes yielded by each specimen.

3d. The exact chemical composition of each ash by a detailed analysis.

*Determination of the water.*

This was effected by reducing the coal to a moderately fine powder, and then in a platinum or clean Hessian crucible heating a given weight of it, to a temperature short of redness, sufficiently high to expel the water, and yet not such as to endanger any decomposition of the coal. Sulphuret of iron, if present, would require, for example, a red heat, which was never given.

*Determination of the proportion of ashes.*

We accomplished this by placing a given quantity, always two French grammes, or 30.85 grains, reduced to a coarse powder in a crucible, and exposing it for one or two hours to the full action of a strong fire of anthracite in a furnace, until on inspection nothing but a pure uniform ash remained. Care was of course taken to guard against the loss of any of the light ashes by the draught of the furnace. So soon as the ashes thus procured were sufficiently cold, and before they could increase in weight by absorbing moisture from the atmosphere, they were weighed.

*Analysis of the ashes.*

As the same general method, embracing nearly the same series of steps, was employed upon each speci-

men, one description of the process, as applied in common to all, will here suffice.

From the quantity of silica in the ashes, and from their being almost wholly insoluble in acids, it was necessary to bring them to a soluble state by the usual method of fusing with an alkaline carbonate. The process adopted was therefore as follows:

A. A given portion of each ashes in a state of dryness, always 2 grammes, (30.85 grs.) was first intimately mixed with five times its weight of pure carbonate of soda; the mixture was transferred to a platinum crucible with a cover, which for protection was enclosed in a larger Hesssian crucible containing pure sand. The whole was now exposed to the full heat of the anthracite furnace for at least an hour, when the mass was invariably vitrified, congealing into an opake, and generally a bluish green, porcelain.

B. The fused mass was now separated from the crucible, by dissolving in distilled water, acidulated with muriatic acid. Muriatic acid was then added in sufficient quantity to decompose the whole, leaving a slight acid excess; and after reposing a few hours to digest, the whole was evaporated to dryness in a porcelain capsule.

C. When the dry mass had grown cool, it was moistened with concentrated muriatic acid, and allowed to rest thus half an hour. It was then treated with water. The silica thereby left undissolved was filtered, properly washed, dried, heated to redness

and weighed, deducting always the weight of the ashes of the filter.

D. The acid solution, containing now every thing but the silica, was neutralized with ammonia, and a little ammonia added in excess. Alumina and peroxide of iron were thus precipitated, accompanied by a very trivial quantity of magnesia, not in this case associated with any manganese, however, as but a trace of this occurs in the ashes. The liquid filtered from this precipitate was treated with oxalate of ammonia, to precipitate the lime, which was done at once in order to prevent the production of carbonate of lime, by absorption of the carbonic acid of the air. The oxalate of lime was converted into carbonate of lime, and the quantity of lime estimated from the amount of this latter.

E. The precipitate above mentioned, containing the alumina, oxide of iron &c., was redissolved in muriatic acid carefully avoiding an excess. The solution was then boiled with caustic potash.

The peroxide of iron, with any magnesia and protoxide of manganese present, were thus precipitated, and the precipitate again dissolved in muriatic acid, the solution diluted, and saturated with ammonia. Succinate of ammonia was next added, to precipitate the peroxide of iron, which was either estimated from the succinate, or brought to the state of an oxide and then weighed.

The solution filtered from the succinate of iron

was mixed with that filtered from the oxalate of lime, and the liquid mass treated for manganese. In none of our analyses did any measurable quantity of this appear, though through several of the previous stages very feeble indications of its presence were detected by the peculiar tinge which it gives.

Having thus ascertained that the manganese in the ashes was a mere trace, the steps were simplified in other cases by weighing directly the precipitate obtained in (E) insoluble in potassa, after washing off the adhering potassa, and drying to expel imbibed moisture, estimating as a hydrate, or heating to expel the combined water.

F. For magnesia, the solutions containing it having been mixed, were treated in the manner recommended by Stromeyer, adding ammonia and phosphate of soda, and estimating the magnesia from the quantity of ammoniaco-phosphate of magnesia precipitated.

G. The alumina, previously dissolved by the caustic potash (E,) was precipitated after the addition of muriatic acid, by ammonia, or carbonate of ammonia, generally the former. It was carefully washed, dried, ignited in a platinum crucible at a very high heat and weighed.

The above are all the ingredients of the ashes of whose presence we had any proof, though care was taken to test for other substances.

The numerous minor steps and precautions requisite in the course of this rather operose analysis, we

do not here describe, as they are known to practical chemists, and would swell this article unnecessarily.

### *Tamaqua Coal.*

The specimens of this coal were obligingly presented to us by the agent of the company. They were large, and stated to be characteristic of the various sorts of coal in each vein. The specimens sent us belonged to veins C, D, E, M, N, P, Q, R, of the Tamaqua mine. Two specimens, marked S, accompanied the others; the marking not referring, however, to a particular vein.

### *Description.*

R. Colour darker than iron black; frangible; fracture uneven; rather schistose; cross fracture irregular, with flat elliptical concentric plates, giving it the name of bird's eye coal. The bird's eye surfaces often contain a thin white flake, or scale of pure silica. The cross fracture, especially, is often full of minute burrs, such as may be made in a soft mass, by pricking it obliquely with the point of a needle.

To this variety belong R, N, &c.

P. Color the same; massive compact, shows indistinctly the striæ of deposition; fracture irregular, tending to conchoidal; lustre shining; semi-metallic, sectile to the knife.

The same description will apply to C and M.

E. Color same, rather lighter; massive; fracture

large, conchoidal; laminæ of deposition not distinguishable until partially reduced to cinder; lustre very shining, semi-metallic.

This includes D and E.

*Water.*

2 grammes (30.85 grs.) of a medium specimen in fine powder were heated to a little below redness—when

| | | | |
|---|---|---|---|
| C lost | .126 gms. | or 6.3 | per cent. |
| D do. | .122 " | 6.1 | " |
| E do. | .090 " | 4.5 | " |

The estimation of the water was not extended to the others, as being probably a variable constituent it will be necessary to measure it anew when an entire analysis is made of the carbon, the gases and the ashes. The results above given suffice to display the average proportion of water in anthracite in its ordinary dry state.

*Proportion of Ashes.*

2 grammes (30.85 grs.) of each specimen reduced to powder, and subjected in a crucible to the full action of the furnace for two or three hours, gave when the ashes were cool, the following:

| | grammes. | | per cent. |
|---|---|---|---|
| C, yellow ash, | .165 | or | 8.25 |
| C, do. | .168 | | 8.4 |

| | grammes. | per cent. |
|---|---|---|
| D, light reddish brown ash, | .147 | 7.3 |
| D, do. do. | .150 | or 7.5 |
| E, light yellow ash, flaky, | .145 | 7.2 |
| E, light red ash, | .149 | 7.4 |
| M, buff ash, with white specks, | .187 | 9.3 |
| M, do. uniform, | .161 | 8.0. |
| M, do. uniform, | .165 | 8.2 |
| N, red ash, | .164 | 8.2 |
| N, do. | .166 | 8.3 |
| P, light buff ash, | .140 | 7.0 |
| P, do. do. | .145 | 7.2 |
| Q, salmon colored ash, | .087 | 4.3 |
| Q, do. do. do. | .083 | 4.1 |
| R, yellow ash, | .136 | 6.8 |
| R, do. do. | .134 | 6.7 |
| Fossil charcoal from vein | | |
| E, white ash, | .045 | 2.2 |
| Again, do. do. | .045 | 2.2 |

*Analysis of Ashes.*

The first specimen chosen was one of those marked S, which drew our attention, from the peculiar whiteness of its ash. It yielded—

(SPECIMEN S)

| | |
|---|---|
| Silica, | 1.060 |
| Alumina, | .716 |
| Oxide of iron, | .147 |
| Lime, | .036 |
| Magnesia, | .022 |
| | 1.981 in 2 grammes. |

It is possible that the whiteness of this ash may be owing to the large proportion of silica and small proportion of oxide of iron. From the bluish green hue of the fused mass in this analysis, and from the difficulty, at a subsequent step, of reducing the iron to the state of peroxide, there seems every reason to suppose the iron in the state chiefly of protoxide in the ashes. Whether the reddish tint of some specimens is due to any considerable quantity of peroxide, is doubtful; for the Lycoming county bituminous coal, presently to be presented, gave on analysis scarcely a trace of iron, though the ashes had quite as much of reddish tinge as many anthracite specimens containing two per cent. of oxide of iron.

The next ash analyzed was from the vein R, which was chosen as being usually one of the reddest, though this hue is by no means constant, even from the same mass; the ash being sometimes of a light salmon.

(VEIN R.)

| | |
|---|---|
| Silica, | .904 |
| Alumina, | .675 |
| Oxide of iron, | .331 |
| Lime, | .036 |
| Magnesia, | .036 |

1.982 in 2 grammes.

In this analysis, the oxide of iron seemed to have been originally estimated too high, probably from not having fully separated adhering potash, when washing the filter; it was protoxide of iron .367; one-tenth was allowed for the probable error. A similar small reduction for the alumina was also made, and for the same reason.

Not satisfied with the above results, the analysis of R was repeated.

(VEIN R.)

| | |
|---|---|
| Silica, | .940 |
| Alumina, | .753 |
| Oxide of iron and a trace of manganese, | .251. |
| Lime, | .041 |
| Magnesia, | .021 |

2.006 from two grammes.

In this case close attention was given to the manganese, but it did not exist in quantity sufficient to estimate, its presence being indicated only by a slight characteristic pink tint, left on the capsule.

An ash was now selected for analysis, possessing an intermediate or light yellowish tint. It was derived from vein E.

(VEIN E)

| | |
|---|---|
| Silica, | 1.017 |
| Alumina, | .601 |
| Oxide of iron, | .290 |
| Lime, | .059 |
| Magnesia, | .030 |
| | 1.987 in two grms. |

Here is an analysis showing less silica and more iron than S, both circumstances having possibly a tendency to give this ash the most color.

## BITUMINOUS COAL OF LYCOMING COUNTY.

This coal occurs on the west branch of the Susquehanna, above Dunnstown, about forty miles from Williamsport, where a mine has recently been opened. It is characterized by being very friable, breaking up into small fragments with a cubical fracture. It shows distinctly its laminæ of deposition; is very black, and possesses an uncommonly bright lustre.

It cakes readily in combustion, and yields a pretty dense coke.

*Water.*

The variety labelled diamond coal was heated to a point just short of that which was found to decompose it. The loss of weight ascribed to water was in 2 grammes:

| | |
|---|---|
| 1st trial, | 4.1 per cent. |
| 2d do. more correctly, | 2.7 " |

*Proportion of Ash.*

2 gms. yielded, of light yellowish ash .10 gms. or 5.0 pr. ct.
2 do. do. do. do. .11 " 5.5 "

No smell of sulphur was detected in this experiment, nor did a test employed for the purpose indicate any.

From the small quantity of ash, and from this circumstance, it is to be regarded as a pure variety of bituminous coal.

*Proportion of Coke.*

| | | |
|---|---|---|
| 1 ounce gave | .852 | loss .148 |
| 1 do. more accurately done, | .825 | " .175 |
| 1 do. a still better result, | .772 | " .228 |

*Analysis of the Ash.*

(DIAMOND COAL.)

| | | |
|---|---|---|
| Silica, | 1.156 | |
| Alumina, | .705 | |
| Oxide of iron, | | a mere trace, |
| Lime, | .103 | |
| Magnesia, | .020 | |
| | 1.984 | in 2 grammes, |
| | .992 | in 1 gramme, |
| Loss, | .002 | |
| | 1.000 | |

The most remarkable feature in this ash, is the almost entire absence of iron.

---

In seeking to ascertain what has been already done in the analysis of the coals of this country, we find that our predecessors in the field have been very few, and that no examinations of the specimens described in this paper have been made, the only one approaching sufficiently near for comparison, being that by our associate, Mr. Vanuxem. He analysed the Lehigh, and makes it to contain, in 100 grains,

| | | |
|---|---|---|
| | Carbon, | 90.1 |
| | Water, | 6.6 |
| Dirty white ash, 3.3 grs. | Silica, | 1.2 |
| | Alumina, | 1.1 |
| | Iron and manganese, | .2 |
| | Loss, | .8 |
| | | 100.0 |

One hundred grains of ash would, therefore, according to him, contain—

| | |
|---|---|
| Silica, | 36.3 |
| Alumina, | 33.3 |
| Iron and manganese, | 6.1 |
| Loss, | 24.3 |
| | 100.0 |

The average of our results upon the ashes of the Tamaqua anthracite, gives—

| | |
|---|---|
| Silica, | 47 |
| Alumina, | 36 |
| Oxide of iron, | 14.5 |
| Lime, | 1.5 |
| Magnesia, | 1.0 |
| | 100.0 |

The difference of the two analyses is considerable, and seems too great to be accounted for altogether by the difference between the coal of the two localities, as the ashes which we procured from the Lehigh anthracite differed in no way, externally, from those of the specimens from which our results above were procured. Not having yet investigated the ashes of the Lehigh, further than to procure the proportion in which they appear in the coal, we are unable at present to explain the absence of lime and magnesia in the results we quote, but venture the suggestion, that as Mr. Vanuxem's researches were made for a pur-

pose requiring at the time less accuracy than was compatible with our object, and as we pursued the most approved methods in practice, it may still be found that no material difference will show itself between the composition of the ashes of the Lehigh and of other anthracites. The proportion of ash given by that chemist we certainly regard as too low.

Of the specific gravities given by other experimenters, we may mention that—

Olmsted states that of the coal of Rhode Island, 1.77
Lehigh, 1.55
Bull gives to the Rhode Island, 1.438
Lehigh, 1.494
Schuylkill, 1.453
Professor Silliman states the specific gravity of the Rhode Island to be 1.75
The mean of the anthracite of Pennsylvania he states at 1.55
The Schuylkill variety, 1.52
See Amer. Journ. Science, vols. x. and xi.
The mean of the specific gravities found by us for the Little Schuylkill coal, is 1.621

## SPECIFIC GRAVITY.

The specific gravities of the specimens of coal, from portions of which the ashes referred to in the preceding pages were procured, were taken with considerable care. A balance made by Fortin, and belonging to the apparatus of the University, and another made by Saxton, were used in the determination; both balances are of excellent workmanship. It has been supposed necessary to coat the specimens of coal with wax, before weighing them in water, to prevent the entrance of water into very minute fissures, and the displacement of air. The compact structure of most of the varieties upon which we experimented, seemed to render this precaution unnecessary; but that we might incur no chance of error from this source, we weighed each specimen both before and after its immersion in water, to ascertain what increase of weight if any had occurred: the results will be found below. In coating the coal with wax, we found liabilities to error from a change of density in the wax, if pressed, and from the imperfect exclusion of the air from between the wax and coal when the latter was not heated, which much exceeded the greatest difference produced from the absorption of water by the least compact specimens. Heating the coal to produce the close contact of the wax, was, of course, inadmissible. The

calculation of the specific gravity of the coal itself, when the weight of the specimen without and with its coating of wax, the weight, when coated, in the water, and the specific gravity of the wax, are known is so simple a problem and the coating appears to offer such a safe mode of experimenting, that we did not abandon it without reluctance, nor until a fair trial had been given to it, which proved its inferiority to the direct method.

When the weights differ before and after immersion in water, the specific gravity calculated upon each of the weights is given. The following are the results obtained:

COAL FROM VEIN C.

| | grains. | spec. grav. |
|---|---|---|
| Weight before immersion in water, | 24.92 | |
| " after " " | 24.925 | |
| " in water, | 9.95 | 1.664 |

FROM VEIN D.

| | | |
|---|---|---|
| Weight before immersion in water, | 168.325 | 1.637 |
| " after " " | 168.380 | 1.636 |
| " in water, | 65.485 | |

FROM VEIN E.

| | | |
|---|---|---|
| Weight before immersion in water, | 75.58 | |
| " after " " | 75.601 | |
| " in water, | 28.974 | 1.621 |

FROM VEIN M.

| | grains. | spec. grav. |
|---|---|---|
| Weight before immersion in water, | 39.04 | |
| " after " " | 39.01 | |
| " in water, | 14.985 | 1.626 |

FROM VEIN N.

| | | |
|---|---|---|
| Weight before immersion in water, | 145.32 | 1.596 |
| " after " " | 145.95 | 1.592 |
| " in water, | 54.265 | |

ANOTHER SPECIMEN OF N.

| | | |
|---|---|---|
| Weight before immersion in water, | 150.71 | |
| " after " " | 150.74 | |
| " in water, | 55.80 | 1.588 |

FROM VEIN R.

| | | |
|---|---|---|
| Weight before immersion in water, | 60.99 | |
| " after " " | 61.02 | |
| " in water, | 22.61 | 1.589 |

ANOTHER SPECIMEN OF R.

| | | |
|---|---|---|
| Weight before immersion in water, | 48.96 | |
| " after " " | 48.975 | |
| " in water, | 18.17 | 1.592 |

SPECIMEN S.

| | | |
|---|---|---|
| Weight before immersion in water, | 114.21 | |
| " after " " | 114.39 | |
| " in water, | 43.11 | 1.606 |

## *Bituminous Coal of Lycoming County.*

### DIAMOND COAL.

| | grains. | spec. grav. |
|---|---|---|
| Weight before immersion in water, | 163.65 | 1.339 |
| " after " " | 163.81 | 1.339 |
| " in water, | 41.44 | |

*Description of a new genus of Fresh Water Shells.*
By T. A. Conrad. Read August, 1834.

## FAMILY UNIONIDÆ.

### Genus Pleiodon.

*Char. gen.* Testa æquivalvis, inequilateralis. Cardo subarcuatus, subpectinatus, sub natibus attenuatus; dentibus numerosis, transversis, posticè interruptis. Impressiones musculares ut in Anodontis.

*Observations.* The shell, from which the present genus has been constructed, is one of the most striking in its characters and splendid in its nacre of the fresh water bivalves. Exteriorly it has the habit of an Anodonta, but its cardinal teeth, which strongly resemble those of Nucula, eminently distinguish it. These teeth are alternately inserted, a generic character widely differing from Iridina, which is simply crenulated or tuberculated on the margin of the hinge, which is linear, very long, and nearly straight. One or two species admitted into the genus Iridina, have a simple or entire hinge, like Anodonta, and are distinguished only by their form. The present shell, on the contrary, has much the general form or habit of Anodonta, but differs essentially in the hinge. In

fact, it would be considered an Arca, if it inhabited the sea, for the same reason that a remarkable univalve of the Holston river, Tennessee, would be referred to Fusus, were it a marine shell; but its *habit* no less than its habitat entitle it to rank in the same family with Melania. Thus, although the teeth of the Pleiodon resemble those of Arca and Nucula much more than any genus of Unionidæ, the nacre, muscular impressions, epidermis, and even a certain peculiarity of hinge, are characters which at once point out its close affinity to Unio, and leave no doubt of its being a fresh water shell.

Lamarck would probably have placed the present genus in his family Trigonèes, since it certainly more clearly connects his Arcacèes with his Naiades, than Trigonia or Castalia, if the hinge alone is regarded.

The genus Castalia has been united to Unio by Sowerby, but its characters appear sufficiently distinct to separate it generically, although it may more properly be arranged among the Naiades than the Trigonèes, since the animal must be more nearly related to that of Unio than to that of Trigonia, if the recent species of the latter be a marine shell, as is generally supposed; the fossil Trigoniæ were undoubtedly all marine shells.

Authors have disagreed regarding the propriety of separating any of the natural groups of the Lamarckian Naiades, as distinct genera, but I know not how the present species could enter into the genus

Unio, without abandoning the use of those peculiarities of hinge upon which all the genera of bivalves are founded.

### Pleiodon *Macmurtrei*. Tab. xiii.

*Char. spec.* P. Testa ovato-rhombeâ, ventricosâ; latere postico angulato; umbonibus elevatis; natibus retusis; dentibus elevatis, granulatis; intus subroseâ, splendidè margaritaceâ.

Habitat ad Liberiam, in Africa occidentali.

*Description.* Shell ovato-rhomboidal, ventricose; substance of the shell moderately thick; anterior margin obtusely rounded, angulated above; posterior extremity angulated, the margin above descending obliquely and nearly rectilinear, but rounded towards the dorsal margin; umbonial slope subangulated; umbones tumid, rounded, elevated; beaks retuse, approximate; epidermis dark olivaceous, granulated posteriorly, with rays formed by transverse striæ; hinge margin irregularly and slightly arcuated; teeth prominent, granulated, perlaceous; anterior teeth thick; the hinge margin over the muscular impression suddenly contracted; posterior teeth oblique, parallel, but terminating in irregular tubercles near the posterior end; nacre pale pink, pearly and highly iridescent; cavity very capacious.

*Observations.* The striæ in the epidermis, forming rays, are not peculiar to this shell: they are often

PLEIODON MACMURTRIEI.

observed on several species of American Unios, but are never constant in any.

It is uncertain what river this fine shell inhabits, but as it came from Liberia on the western coast of Africa, it probably occurs in the vicinity of that settlement. It was sent to Dr. H. M'Murtrie, the zealous naturalist and translator of Cuvier's "Regne Animal," to whose liberality I owe the opportunity to figure and describe this remarkable shell.

## *Description of a new species of Hinnita.* By T. A. Conrad. Read Sept. 1, 1834.

### FAMILY PECTINIDÆ.

### Genus Hinnita.

### Hinnita *Poulsoni.* Tab. xiv.

*Specific character.* Shell ovate, with distant prominent radiating striæ, having arched scales on each, very numerous and prominent near the base; spaces between the larger striæ with close set prominent undulated squamose lines; color redish brown; inferior valve with concentric laminæ, and squamose on the unattached margin; within whitish, and of a crystalline appearance, and the margin brown; hinge area dark purple; fosset narrow and oblique.

*Observations.* The genus Hinnita was formed by Defrance, to receive a fossil which he supposed to be intermediate between Spondylus and Ostrea. Several recent species have since been added by authors, and the original name *Hinnites* altered to *Hinnita.* Mr. Gray places this interesting group of shells in the the family Spondylidæ, but Sowerby refers it to the Pectinidæ, and thinks it can scarcely claim a generic distinction, and is even doubtful whether it should be separated from Pecten. Two recent species have long been described, and well known by the names of

HINNITA POULSONI.

Drawn on Stone by T. A. Conrad. Printed by Childs & Lehman

*Pecten pusio* and *P. sinuatus*, and the whole group, consisting of at least nine species, recent and fossil, is so natural and striking in its characters, that it cannot be confounded with any other, and will certainly rank among the PECTINIDÆ, where Sowerby and Cuvier have placed it. Defrance described the genus as adhering by one valve, which Sowerby believes to be incorrect; but this character is also given it by Cuvier, and certainly the species here described has every appearance of an adhering shell, the surface of the lower valve resembling that of *Ostrea parasitica*. Indeed, the H. *sinuata* has been found on the coast of France, attached to a *Pecten*.

Two specimens of this species are in the splendid cabinet of my friend Charles A. Poulson, Esq., who has kindly permitted me to describe it; the largest measures three and a half inches in length and four and a half inches in height. The habitat is unknown to me. It differs much from any species of which I have seen the description; but that of *H. Defrancii*, of Deshayes, I have not met with. The oblique position of the cartilage fosset is a character which I do not find stated in the description of any other species.

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.....

1837.

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ERRATA FOR VOLUME VII.

Page 111—For "*Chætanthera," read **Chætaphora*.
" 265— " "Purpura lapilloides," read P. *punctulata*, Sowerby.
" 288— " "that," read *those*—3d line from top.

## *Description of Twelve New Species of Birds, chiefly from the vicinity of the Columbia river.* By JOHN KIRK TOWNSEND.

Read November 15, 1836.

[Mr. TOWNSEND's continued absence prevents the possibility of giving the habits and other particulars in reference to the following birds, discovered by him; for although his notes are very full on this subject, they were not transmitted with the specimens, and therefore must remain unp lished until his return, which is expected e next spring.

During Mr. AUDUBON's recent visit to Philadelphia, he kindly offered to give figures of each

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Read November 15, 1836.

[Mr. TOWNSEND's continued absence prevents the possibility of giving the habits and other particulars in reference to the following birds, discovered by him; for although his notes are very full on this subject, they were not transmitted with the specimens, and therefore must remain unpublished until his return, which is expected early next spring.

During Mr. AUDUBON's recent visit to Philadelphia, he kindly offered to give figures of each

of these species in the coming number of his splendid work on the "BIRDS OF AMERICA;" the proposal was gladly accepted by Mr. TOWNSEND'S friends, as it secured to him these important discoveries in science, which, owing to his protracted absence, were liable to be anticipated by others. To the next plates of Mr. AUDUBON'S work, therefore, we refer the reader for beautiful and accurate figures of the following species.—ED.]

## SIALIA.

S. *occidentalis*. Western Blue Bird.

*Description*. Colour bright blue; shoulders and lower part of the breast, chestnut-rufous; chin and upper part of the breast, azure; belly and vent faintly tinged with blue.

*Female* and *young*, grayish, faintly tinged with blue, becoming brighter on the rump, wings and tail; beneath, pale rufous, and gray. The bill is longer than that of the common native species, which it strongly resembles in many respects.

Inhabits the plains of the Columbia river.

## FRINGILLA.

1. F. *Oregana*. Oregan Snow-finch.

*Description*. Head, throat and upper portion of the breast, black; back, edges of the tertiaries,

and sides beneath the wings, dark chestnut; beneath, and two lateral tail feathers on either side, white; bill and legs luteous. Sexes nearly alike.

This species is nearly related to the common snow-bird, (F. *Hudsonia*) but is rufous above, more decidedly black on the head, and with that colour more restricted and deep on the breast.

Inhabits the forests near the Columbia river.

2. F. *bicolor*. Prairie Finch.

*Description*. Colour black, with a broad band of white on the wing; rump grayish; the female spotted like a common sparrow above and below, with the bar on the wing rufous-white; the tail feathers in both sexes tipt or spotted with white.

Inhabits the plains of the Platte river, and presents many of the habits, as well as the song of the Bob-o-link.

### PLECTROPHANES.

P. *ornata*. Chestnut-coloured Finch.

*Description*. Colour gray and spotted; beneath, except the vent and throat, black; a bright rufous belt over the neck; line over the eye and the two lateral tail feathers on either side, nearly white.

Inhabits the prairies of the Platte river, where it is not uncommon.

## Parus.

1. P. *rufescens.* Chestnut-backed Titmouse.

*Description.* Head, throat, and upper part of the breast and back, blackish-brown; back, rump and sides beneath the wings, bright chestnut, with a broad diverging band along the sides of the neck and below, white. Length 4½ inches.

Inhabits the forests of the Columbia river.

It is nearly allied to P. *Hudsonius*, but is distinguished by its smaller size and chestnut coloured back.

2. P. *minimus.*

*Description.* Colour gray, beneath pale dilute-rufous; head grayish-chestnut; tail elongated; bill very sharp, and slightly bent; the quill and tail feathers faintly edged with whitish.

Inhabits the forests of Columbia river.

## Sylvia.

S. *occidentalis.* Hermit Warbler.

*Description.* Colour leaden gray, spotted with black as far as the back of the neck; upper part of the head, and sides of the face to the shoulders, yellow; throat black; the belly and inner web of the two lateral tail feathers on either side, white.

The female is paler, the head spotted nearly all *over, and the throat* whitish.

Inhabits the forests of the Columbia river, chiefly among fir trees.

2. S. *nigrescens.* Black-throated Gray Warbler.

*Description.* Colour leaden gray, spotted with black; head, broad line through the eyes and throat, black; line over the eye, a broad one from the bill, belly, and two bands on the wings, white; a great part of the three lateral tail feathers on their inner webs, also white; a yellow spot on the lores.

3. S. *Audubonii.* Audubon's Warbler.

*Description.* Colour bluish-gray, spotted with black; breast and sides black; throat, crown, rump, and a patch under the wings, light yellow; a broad band on the wing, belly, vent, and a large spot on the five lateral tail feathers on either side, white.

Female paler, tinged with rufous; beneath spotted with black.

Inhabits the forests of the Columbia river.

4. S. *Townsendi,* (Nuttall.) Townsend's Warbler.

*Description.* Colour bright olive-green, spotted with black; head, cheeks, throat and breast, black; flanks spotted with black; line over the

eye a broad diverging one beneath to the shoulder and belly, yellow; rump, two bands on the wings, and the inner webs of the three lateral tail feathers on each side, almost wholly white.

The female of this species is unknown.

Inhabits the shady forests of the Columbia river, where it probably breeds.

### Orpheus.

O. *montanus*. Mountain Mocking-bird.

*Description.* Colour brownish gray; beneath and chin whitish; spotted nearly to the vent; three lateral tail feathers on either side, with a white subterminal spot.

Rather smaller than the Mocking-bird.

Inhabits the plains of the Rocky Mountains.

### Charadrius.

C. *montanus*. Rocky Mountain Plover. Audubon, Am. Orn. Pl. 350.

*Description.* Colour rufous gray; beneath nearly white; an elongated white spot on the wing; front and lores nearly black; bill black and slender. A little smaller than the common Golden Plover.

Found in the central table-land of the Rocky Mountains.

The Ornithological Committee have prepared for publication, the following list of Species from the Columbia river. It contains some of those received from Mr. Townsend, which are worth particular notice; those marked thus [*] are described in the preceding pages:

Falco peregrinus,
Æsalon,
Strix cinerea,
Lanius Ludovicianus,
Corvus Columbianus,
Garrulus Stellerii,
ultramarinus,
Icterus Bullockii,
Xanthornus,
Turdus montanus,
solitarius,
nævius,
Muscicapa verticalis,
inornata,
Traillii,
virens,
Tyrannula Richardsonii,
Vireo solitarius,
*Sylvia nigrescens,
Wilsonii,
palpebralis,
calendula,
celata
*Audubonii,
*Townsendi,
*occidentalis,
Troglodites Bewickii,
obsoletus,
fulvus,
Europæus,
*Sialia occidentalis,
arctica,
Anthus spinoletta,
Parus Hudsonicus,
*rufescens,
*minimus,
Emberiza atricapilla,
*Plectrophanes ornata,
Pipilo arctica,
*Fringilla Oregana,
grammacea,
cinerea,
pusilla,
savannah,
*bicolor,
amœna,
pinus,
purpurea,
Orpheus montanus,
Coccothraustes cerulæa,
macculata,
Tanagra Ludoviciana,
Picus torquatus,
villosus,
pubescens,
flaviventris,
Colaptes Mexicanus,
Sitta Canadensis,
Trochilus rufus,
Certhia familiaris,
Hirundo fulva,
thalassina,
Cypselus pelagius,
Tetrao obscurus,
Columba fasciata,
*Charadrius montanus,
Recurvirostra Americana,
Tringa pusilla,
Scolopax grisea
gallinago,
Phalaropus Wilsonii,
Anas Hutchisonii.

## *Description of a New Species of Hare found in South Carolina.* By J. BACHMAN. Pl. 15 and 16.

Read May 10th, 1836.

LEPUS *Palustris.*—Swamp Hare.

This species I discovered fifteen years ago, and deposited a specimen in the Charleston Museum, under an impression that some one among our naturalists would describe it. It has, however, remained undescribed until the present day. After having, since that period, examined a great many individuals, I venture to point out those distinctive marks which constitute it a new species.

| | | | | |
|---|---|---|---|---|
| Total length, | 14 | inches, | | |
| Height to the top of the fore shoulder, | 7 | inches, | | |
| Length of the ears, | 2 | " | 2 | lines, |
| of the hind-foot, | 3 | " | | |
| of the tail, (vertebræ,) | | | 10 | " |
| of tail, including fur, | 1 | " | 5 | " |

Colour of the eyes, which are small, black; upper part of the head brown and grayish ash; ears dark grayish brown; under the chin gray; throat yellowish brown; belly gray; tail brown, *a little lighter* below; the back and whole upper

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LEPUS PALUSTRIS

parts yellowish brown, intermixed with black; palms of the hind feet thinly covered with hair.

In order to describe this animal more particularly, I will point out the difference between the species now under consideration, and the American Hare (Lepus Americanus,) to which it bears some resemblance.

The ears of the present species are considerably shorter and rounder; the whole of the upper parts of the animal is darker; the hairs, which are interspersed throughout the fur, are black, long and stiff, and have the appearance of the long hairs usually found in the rat. The belly, rump and tail of the American Hare, are white; whilst, in the present species, the belly is light gray inclined to rufous, rump and tail light brown, the latter a little lighter beneath and very short. The American Hare has a whitish spot before the eyes, and another behind the cheeks, which, in the present species are wanting. The pelage is also much longer and less compact than in the other. The eyes are small, not much more than half the size of the American hare; and the palms of the hind feet are less covered with hair and much smaller; the nails also are stronger, of a darker colour, more exposed, and the whole appearance is more coarse and rough. There are other marks of difference which I shall point out when the animal

will be more particularly described. But the habits of the Swamp Hare differ even more from the Lepus Americanus, than the external form and markings. The Swamp Hare is altogether confined to low marshy grounds, and, as I have frequently noticed, cannot be induced to take the open fields or high grounds. I have also seen it take to the water, which the other avoids. Instead of leaping like the common Hare, it runs low to the ground, darting through the marsh in the manner of the rat. It breeds in these low marshes on the small hillocks. In one instance I discovered three, and in another five young ones in the nest, which was composed of coarse grass, compactly made and arched over. The American Hare is swift of foot, and cannot easily be overtaken by a dog; whereas, the present species runs much more slowly and may be easily caught by a dog in a few minutes; indeed, the negroes often run them down in favourable situations. I have also invariably perceived in this species a strong marshy smell, which the other does not possess; their flesh is also darker, but in no respect inferior.

This species is somewhat rare in most parts of South Carolina (which is probably its northern limits), and I have never seen it more than forty miles from the sea coast. It seems, however, to be

somewhat more abundant now than formerly, multiplying rapidly in particular localities, and will probably be found more numerous as we advance southwardly. I recollect having seen two of these animals at one time in the Savannah market, and received a young one from Florida, which was preserved alive for several months. It was obtained on a small Island called Rabbit Key, near Indian Key.

NOTE. Since the above was written, I have had an opportunity of examining more closely some remarkable habits of the above animal, and add some extracts from my diary of the 9th and 12th of April, 1832.

April 9th. Had an opportunity to day in this District (Colleton) of ascertaining that the Swamp Hare is in many respects an aquatic animal. In consequence of a heavy fall of rain the swamps and rice fields were full of water. I thought this a good time to ascertain what became of this quadruped on those occasions when the marshes (its favourite haunts,) were covered with water. I was accompanied by two friends, Major Lee and Benjamin Logan, Esq. In riding to the edge of an extensive sheet of water we were surprised to see a Swamp Hare swimming deliberately from a causeway which formed the public road, and

making for the deepest water. Shortly after, we saw another, as if in sport, swimming from one high knoll of ground to another. Believing it possible that this aquatic habit (so unusual in animals of this genus,) originated from the swollen state of the marshes, which induced them to linger in the neighbourhood of their usual haunts, we beat along the adjoining thickets and perceived them running for the water as soon as started, and swimming with such rapidity that some of them escaped from an active Newfoundland dog that accompanied us. Several of these animals, when they believed themselves unobserved, hid themselves in the water, about ten or fifteen yards from the shore, protruding only their eyes and the point of the nose above the surface. In this situation, with their ears lying flat on their necks, they were scarcely perceptible. When gently touched with a stick they seemed unwilling to move, till they perceived that they were observed, when they swam off with great rapidity.

April 10th. To-day, we took a boat and rowed for several miles over the marshes; found a number of these animals wherever the marsh-grass and reeds protruded above the water; others were seen leaving the shores and making their way over an extensive sheet of water.

April 12th. The waters had now subsided to

1

3

2

4

1. 2. Ear and hind foot of L. palustris. 3. 4 Ear and hind foot of L. amer

their usual level. Toward evening we visited a reservoir near the rice fields, observed a number of Swamp Hares swimming in places where the water was seven or eight feet deep, meeting and pursuing each other as if in sport, and seeming to be quite at home in this element. I have observed when the Lepus Americanus approaches the water, it generally goes round or leaps over it; but the Lepus palustris enters it readily and swims across.

The present species also breeds two months later than the Lepus Americanus, the latter having young in this vicinity as early as the middle of February; whereas the former does not litter till the middle of April.* There were twenty-one specimens procured within the last four days. All the females were examined, and none of them had as yet produced young, although with some of them, this would have been the case in three or four days.

* I have since ascertained that the Swamp Hare occasionally has its young earlier than stated above. I have, however, met with but a single instance.

## *On the fusing point of Zinc, and a reference to the relation between the tenacity and the fusibility of the metals in general.* By WALTER R. JOHNSON, A. M., Mem. Acad. Nat. Sci. Phila., Prof. of Mech. and Nat. Phil. in the Frank. Inst., &c.

Read Nov. 1st, and 22d, and Dec. 6th, 1836.

THE elevated temperature at which zinc is fused, and the imperfection of the means formerly employed to determine the melting points of the more obdurate metals, prevented the attainment of the same precision in regard to it, which was found practicable in the case of lead, tin, bismuth and their alloys.

GUYTON MORVEAU, by means of his platina expansion pyrometer, had fixed the melting point of zinc, at 705.25 degrees of Fahrenheit. His instrument depended for its action on the difference in the expansions of a plate of baked porcelain and one of platina. That his determination of the melting point of zinc is inaccurate, may be inferred from the fact, that he places the temperature of *red heat* in *daylight* at 517° Fahrenheit;

whereas, it is well known that redness does not begin to appear, even in the dark, until we have considerably exceeded the boiling point of mercury, which, measured by the expansion of that liquid, corrected for the dilation of glass, was found by Mr. CRICHTON, to be 660° Fahrenheit.

Mr. DANIEL measured the expansion of zinc from 62° to 212°, and from 62° to 662°, as also from the first mentioned point to that of its fusion,—and taking the amount of the two former expansions as the measures of the temperature of fusion, he found it to be 848°, when the expansion to 212° was applied; and 960°, when that to 662° was taken for the standard. On applying to this metal, however, his *pyrometer*, which is founded on the difference of expansion between platina and plumbago, he found the degree indicated for the fusing point of zinc to be 773°; thus differing from MORVEAU by an excess of about 68°, while in his determination of the fusing point of other metals of high melting points, he falls below MORVEAU. In the case of cast iron, this difference amounts to 5217 degrees; DANIEL giving for the fusing point of that metal only 3479°, while MORVEAU gives 8696°. In the publications of the Society for the Diffusion of Useful Knowledge, the fusing point of zinc is said to be 700°. Having, in the course of some investigations with the steam py-

rometer, become satisfied that the temperature at which iron is distinctly red in daylight, is stated too low by the writers on that subject, and that the temperature of melting zinc is rather below than above that point, I felt desirous of testing the correctness of the generally received statements.

With this view, several experiments were made by plunging the standard piece of the pyrometer into a mass of melted zinc, contained in a cylinder of wrought iron; continuing it there for 15 or 20 minutes, allowing the iron container and the zinc in the mean time to be kept just above the temperature of fusion, so that the standard piece could be withdrawn without impediment. When taken from the melted mass, some portion of zinc usually adhered, much the greater part of which, however, was readily removed by a smart blow or two given with a rod of iron to the standard piece while suspended by the wire. The portion (usually a few grains,) which still continued to adhere, served, by solidifying, to show the moment when the iron had cooled to the point of the congelation of zinc. When that was attained, the standard piece was plunged into the boiling water of the pyrometer, the weight of vapour which escaped was ascertained in the usual manner, and the quantity of zinc which adhered was subsequently found, by

weighing the standard piece with the pelicles of zinc still adhering, and deducting its previous, known weight. This was then added to the apparent weight of vapour which had escaped, and by allowing a correction for the weight of adhering zinc and its known specific heat, it was easy to arrive at a just calculation of the temperature of the iron at the moment of immersion.

In this manner were made several successive trials, in neither of which did the standard piece, at the time the zinc ceased to be fluid upon its surface, present the least luminousness in daylight, but as it had been a little before withdrawn from the bath of melted zinc, which had just ceased to appear luminous, it is conceived that this point could not be far remote,—probably not more than 100 or 150 degrees.

In the first experiment, the number of parts of vapour read from the revolving counterpoise was 776; the number of parts of zinc adhering, 105; for which the correction to be added to the observed weight is 92; and as the experiment, in all cases, terminates at 212°, this number is to be added to the sum of the others in order to obtain the fusing point on Fahrenheit's scale = 1080°. Suspecting that the immersion might have been made a little too soon, or before the true solidifying point had been attained, I made a second trial,

in which the iron was not immersed until it was so far cooled as to prevent the adhering zinc from being scraped off with a knife. This trial yielded the result of 953° for the melting point; conceived to be too low.

A third trial, in which the efforts to remove the zinc were not persevered in quite so long as in the preceding case, gave 1032°. Admitting the possibility that the last experiment was still a little above the truth, we may combine it with the preceding, to obtain a mean for the approximate temperature of melting zinc, viz.: 993°.

If we knew any temperature at which heat ceased to exert an influence adverse to the cohesion of a metal, that point might obviously be assumed as the maximum of tenacity; and, as at the point of fusion all tenacity is overcome, the gradual advance from no tenacity to the maximum, might be marked by the degrees of heat below the point of fusion at which trials of tenacity are made; since it is obvious that whatever mechanical force we apply to overcome tenacity will be so much less than the force at maximum tenacity, as the quantity of heat employed to assist us is the greater. It will be my object, in the succeeding part of this paper, to trace, at least approximately, the law of tenacity, as dependent on this principle, in some of the more fusible metals.

The metals selected were tin, lead, bismuth, and an alloy of tin and lead. On these four materials were made several experiments at ordinary temperatures, and, on some of them, other trials, at points above or below the range of atmospheric variations.

*Experiment* 1. The first experiment was on a bar of stream tin, cast, at a temperature not much above the melting point, into a mould one foot in length, of uniform area of section throughout its length. The figure of the cross section was a trapezium, the two opposite and parallel sides having lengths differing about one inch from each other. The area of this cross section was .385595.—This bar required to draw it asunder 2417.5 lbs., equal to 6282 lbs. per square inch. The area of the section of the fracture was .26714 of a square inch, and the amount of constriction, consequently a little more than $\frac{3}{7}$ of the whole.

*Exp.* 2. This experiment was made on a different bar from the preceding. In order to reduce the temperature of the bar below that of the air, it was enclosed in snow closely packed around the bar, leaving only a small portion of each end projecting, for the purpose of attaching it to the opposite parts of the machine employed as a test. When connected, the coupling parts of the appa-

ratus, as well as the bar, were surrounded with snow closely packed, and the whole wrapped with several folds of linen cloth, to sustain the snow and guard in part against radiation and the contact of the air. Having allowed sufficient time for the whole apparatus to attain a uniform temperature, the force was applied, and it was found that the fracture took place much more slowly than in the first experiment, and gave a result of 6504 lbs. per square inch.

*Exp.* 3. In order to guard against any error which might be assigned to the last experiment when compared with the first, in consequence of the two having been made on different specimens of the cast tin, I now caused the machine to take hold of another part of the bar, which had been broken at 32°, and, on applying the weights at a temperature of 50°, it gave way with a force of 6258 lbs. per square inch.

*Exp.* 4. At the temperature of 50° the same bar again gave a result identical with that which had been obtained in the *first* trial, viz.: 6282 lbs. per square inch.

In all these experiments, it was observed that the section of fracture was irregular and jagged throughout.

In comparing the experiments of Mr. RENNIE with the mean of 3 of those above cited at 50°—52° of temperature, we find a difference of no less than 1538 lbs. per square inch, by which the result of that experimenter falls short of that which I have obtained. The result of Mr. EMERSON was very near that above given, viz.: 6255.

In seeking the cause of such discrepancies as that between Mr. RENNIE and myself, we must look to other grounds than the accidental impurities of the metal, or varieties in the mode of applying the force. It is probably to be found in the temperature at which the bars were severally cast.

*Exp.* 5. Another bar, having a cross section of .405816, was cast at a somewhat higher temperature than the preceding. When tried, it was found to yield a result of 6040 lbs. per square inch. In the course of the operation upon this bar, it was observed that the first permanent elongation did not take place, until rather more than $\frac{2}{3}$ of the breaking weight had been applied. In order to render the influence of the casting temperature still more unequivocal, I cast several bars, at temperatures varying from that already described to a bright red heat. The result was, that a gradual diminution of the tenacity of the bars when

cold was observed, conforming apparently to the slowness with which the metal finally became congealed, and the consequent perfection with which the crystalline arrangement was allowed to be assumed.

*Exp.* 6, 7, 8. On three several bars cast very hot, but below redness, were obtained the following results, viz.:

| | | | |
|---|---|---|---|
| 1 at 52° | exhibiting | strength of | 5208 |
| 1 at 62 | " | " | 5174 |
| 1 at 66 | " | " | 5174 |
| | Mean of the three | | 5185 |

In all these cases the fracture exhibited regular crystalline arrangements, particularly in the interior portion of the section. The outer coat of the metal was however generally amorphous, and as the force was very gradually applied and could at pleasure be arrested before the exterior coat of fibres parted, the latter often exhibited the appearance of a hole quite through the bar in the direction of its thickness, the fibres at the edges and corners still continuing to retain their hold and extend themselves after the central, and more perfectly crystalline mass had given way. Another interesting circumstance was also observ-

able; the crystalline arrangement had a dividing plane cutting the centre of the bar in the direction of its breadth.

*Exp.* 9. A bar was cast at a temperature above redness into the mould previously heated, but below the melting point of tin. This bar gave a result of 5062 lbs. per square inch, at the temperature of 59°. Hence it appears that the influence of casting temperature may extend to about $\frac{1}{6}$ of the tenacity of that which is cast but little above the melting point, the higher casting temperatures giving the lower tenacities.

In order to compare the experiment at 32° with those which were subsequently made on *hot-cast* bars, it is necessary to do it through the medium of those trials at 50°—52° which were made on bars of the same character as the one tried at the freezing point. Thus 6274 : 5185 : : 6504 : 5375= the strength of the hot-cast bars at 32°.

Having thus in some measure ascertained the effect of the mode of preparing the specimens, I proceeded to investigate the tenacity of bars cast at a high temperature, when subsequently heated above the ordinary range of the atmosphere. For this purpose the bars were made to pass through a bath of water kept hot by a spirit-lamp.

*Exp.* 10, 11, 12. In this manner were made three experiments; one at 122°, giving a strength of 3510 pounds per square inch; and two others, at 212°, giving respectively 2476 and 2328 pounds; mean 2402. The elongation of the bars was, in these cases, confined to the part in the hot water. The nature of the fracture was similar to that observed on the hot cast bars, when tried at low temperatures. From what has just been stated, it is evident that at 122° the strength of tin is but little more than three-fifths of what it is at 60°, and at 212° it is less than half as much as at 60°. In accordance with what has been already stated, we may now consider the difference between the melting point of tin and each of the above temperatures, as a series of quantities, corresponding with which is another series representing the tenacities at those temperatures respectively. It is evident that if the tenacity be a simple function of the *temperature below the melting point*, two points will be sufficient to establish the law, but if it be found that the function itself is variable, in other words, that the curve representing the correspondencies between the temperatures and tenacities has a point of inflection, we shall be only able to examine it by discussing several points on each side of the inflection. I will first present a table of the experiments thus far detailed.

| No. of experiment. | Mode of casting. | Area of section. | Temperature at time of trial. | Strength in lbs. per sq. inch. | Date. |
|---|---|---|---|---|---|
| 1 | Cool, into cold mould. | .385595 | 52° | 6282 | 1836, March 5 |
| 2 | do. | do. | 32° | 6504 | do. |
| 3 | do. | do. | 50° | 6258 | do. |
| 4 | do. | do. | 50° | 6282 | do. |
| 5 | do. | .405816 | 52° | 6040 | March 7 |
| 6 | Very hot, not red. | .385595 | 52° | 5208 | do. |
| 7 | do. | do. | 61° | 5174 | April 2 |
| 8 | do. | do. | 66° | 5174 | April 9 |
| 9 | Red hot into hot mould. | do. | 59° | 5062 | April 17 |
| 10 | Hot, not red. | do. | 122° | 3510 | April 2 |
| 11 | do. | do. | 212° | 2476 | do. |
| 12 | do. | do. | 212° | 2328 | do. |

By comparing the above calculated result on a hot-cast bar, broken at 32°, with the experimental results on the same bar, broken at 60°, as deduced from experiments 6, 7 and 8; at 122°, as given by experiment 10; and at 212°, as obtained from the mean of experiments 11 and 12, we get the following series of temperatures below melting point, the correspondent tenacities in pounds per square inch, and the function of temperature

below fusing point, which represents the tenacity.

| No. of the comparison. | Temperature of the experiment. | Degrees below the fusing point of tin. | Tenacities in lbs. per square inch. | Log. of the degrees below fusing. | Log. of the tenacity. | Power of the temperature representing the tenacity. |
|---|---|---|---|---|---|---|
| 1 | 32 | 410 | 5375 | .6127839 | .7303785 | 1.206 |
| 2 | 60 | 382 | 5185 | .5820634 | .7147488 | 1.409 |
| 3 | 122 | 320 | 3510 | .5051500 | .5453071 | 1.690 |
| 4 | 212 | 230 | 2402 | .3617278 | .3805730 | 1.352 |

The above powers of the temperature, which represent the correspondent tenacities at the different parts of the thermometric scale, are derived from a comparison of each experiment with every one of the others, by the formula $\varphi = \frac{\text{Log } c - \text{Log } c'}{\text{Log } t - \text{Log } t'}$; where $\varphi$ is the power sought, t a given distance on the scale of temperature below the fusing point, t' another, but less distance below the same point, c the cohesion at the temperature t, and c' the cohesion at t'. It has sometimes been supposed that a certain relation existed between the temperature of fusion, the tenacity, and the specific gravity of metals. In order to test the correctness of this supposition, I made a few experiments on other metals, the melting points and specific gravities of which are known. It has been shown above, that the law of tenacity for tin, as *dependent* on temperature, is not a *simple rela-*

*tion*, identical throughout the scale; and the fusing points of different metals are at different distances from the ordinary temperature of the air. Their laws of tenacity, commencing from their respective melting points, *may* also be different one from another; and even if alike, still two metals must, at any assumed point of the scale, be found at very different distances apart, from what they would be at another point of the same scale.

From these considerations, it is easy to foresee that if it should so happen that the specific gravity of a metal multiplied by its tenacity at one temperature, gave a product representing its fusing temperature, and that another metal should have such a tenacity at the same point, and such a specific gravity as, when the two were multiplied, would give a result corresponding to *its* melting temperature, still it would not follow that at all other temperatures the tenacities multiplied by the respective specific gravities, would give results proportionate to the same quantities, that is, to the fusing temperatures.

If the tenacity of tin, as a solid, were taken at 442°, it would be found 0; but that of lead, at the same temperature, being 170° below its melting point, would be an appreciable quantity, probably not less than one-sixth or one-eighth of

its cohesion at 60°. Again, the cohesion of mercury at —39° is 0; below that point, it becomes sensible, and probably goes on increasing according to some law, with the decrease of temperature; iron at —39° is, according to the generally received opinion, weaker than at +32°; in other words, it has, if this opinion be correct, passed its maximum of tenacity, by an abstraction of heat, before mercury has begun to receive tenacity by the same means. The specific gravities of the two substances have, in the mean time, undergone no such change as essentially to affect the product obtained by multiplying it by the *tenacity*. In the following table, the tenacities, excepting for zinc and silver, were obtained from my own experiments. The fusing points of the first three metals in the table are derived from other experimenters; that of wrought iron is taken from the mean of two experiments by different methods, given by CLEMENT and DESORMES, who used for *measures*, the melting of ice, and the heating of water, in the two cases respectively. The other melting points, viz.: those for zinc, copper, silver, cast iron, and the alloy of tin and lead, are the results of my experiments, principally with the steam pyrometer.

| Experiments. | Names of metals. | Tenacity at 60 d. Fahr. in lbs. per sq. inch. | Specific gravity at 60 deg. | Fusing point by experiment. | Fusing point by Cloud's formula F=TD. | Specific heat of the metal. | Atomic weight of the metal. |
|---|---|---|---|---|---|---|---|
| 1 | Bismuth. | 2328 | 9.880 | 506 | 269 | .0288 | 71 |
| 2 | Lead. | 3215 | 11.385 | 612 | 426 | .0293 | 103.6 |
| 3 | Tin. | 5185 | 7.299 | 442 | 442 | .0514 | 57.9 |
| 4 | Zinc. | 2600 | 7.000 | 993 | 212 | .0927 | 32.3 |
| 5 | Copper. | 32.826 | 8.986 | 2828 | 3445 | .1043 | 31.6 |
| 6 | Wrought iron. | 57.525 | 7.77 | 3945 | 5220 | .1133 | 28. |
| 7 | Alloy,* tin and lead. 1 T.+3 L. | 3.991 | 9.944 | 514 | 463 | | |
| 8 | Pure silver. | 41.500 | 10.470 | 2194 | 5074 | .0557 | 108. |
| 9 | Cast iron, | 27.000 | 7.248 | 3080 | 2285 | .1205 | |

A comparison of the 5th and 6th columns demonstrates the justness of the preceding remarks, making it evident that no relation, such as has been conjectured to prevail, exists between the specific gravities, tenacities, and fusing points of

* This alloy was in the state contemplated in this investigation at the temperature here noted; but for a considerable distance below that temperature it was in a kind of semi-fluid state, like that of a liquid thickened up with some fine grained solid, and appeared to have its stationary point, or at least *one such point*, at about 500°. The original investigation of the question relating to stationary points in the cooling and solidification of metals and alloys, was made by Rudberg. See *Annales de Chim. et de Phys.* vol. 48, page 353. Subsequent experimenters have, it is believed, added little to his discoveries.

the metals.* The specific heats and atomic weights are annexed in the table to facilitate the comparison of these elements with the tenacities; but it is believed that on them no satisfactory law of tenacities can be founded. In the formula at the head of the 6th column, F is the fusing temperature; T, the tenacity, and D the density of the metal. The melting point of tin is the standard of comparison between the proportional numbers obtained by the formula.

* This *supposed* relation was founded on the erroneous measures of temperature, formerly applied to determine fusing points. The calculation of some fusing temperatures on this principle, and a general statement by which to calculate others, is found in the Transactions of the American Philosophical Society, Vol. I. New Series, p. 168. The paper alluded to was read May 20, 1814.

## *Description of two new species of Trilobites.*

*By* JACOB GREEN, M. D.

Read January 24th, 1837.

Genus Cryphæus—*Green.*

*Body* ovate oblong; convex; trilobate; contractile?

*Buckler* with two reticulated, oculiform tubercles.

*Arches* of the lateral lobes sustaining a *second series* of ribs.

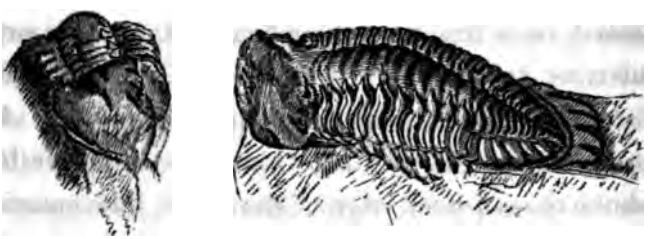
*Tail* elongated, membranaceous, lobate.

The generic term which we have applied to this proposed group of animal remains, is derived from the Greek, and is analogous in its signification to that of Calymene, Asaphus, Ogygia, and tò some other appellations used by fossil zoologists. The head and the upper part of the body of these animals resemble those of the Calymene of BRONGNIART. A very slight obliteration of these fossils along the sides and round the tail, would give them all the characters of a Calymene, and perhaps some animals which have been described as belonging to that genus, will be found hereafter

to belong to the present group. The genus Cryphæus is also, in some respects, very closely allied to Paradoxides, but as the *buckler* is furnished with tubercular oculiferous prominences, they cannot be confounded together. Professor BRONGNIART has indeed described, with a mark of doubt, the Paradoxides Laciniatus, as having eyes—*oculis marginalibus?* but should that interesting relique ever be discovered in a sufficiently perfect state to determine the question, it cannot, we suppose, be included in a genus, one of the principal characters of which is to be *blind*. BRONGNIART says of this group, "Les lobes latéraux (of the buckler) sont unis, et ne paraissent point porter d'yeux réels ni même de protubérances oculiformes." The P. Laciniatus is furnished with a lobate tail, somewhat like that of the Cryphæus, but it differs in many important particulars from any fossil that we have ever observed. Mr. De La Beche does not include it under that name in his list of Trilobites discovered in Europe, though according to WAHLENBERG, it is found in Westrogothia. Professor BRONGNIART, has given, from Mr. STOKES, an imperfect drawing of a trilobite sometimes met with at Dudley, in England, (plate 4, fig. 9.) which has some analogy in its form to the animals proposed to be arranged in our new genus, and Count RASOUMOUSKY has

figured and described a very remarkable relique, found on the Yaousa, near Moscow, which also has a somewhat similar aspect. The second series of ribs, which proceed beyond the costal arches of the Cryphæus, we suppose will distinguish it from every other described Genus.

CRYPHÆUS *Boothii. Green.*



The head is represented above, in a position to show the lip on the left, and the oculiform prominence on the right side. A few of the abdominal articulations appear above and behind the head.

Clypeo antice rotundato; oculis magnis; rugis tribus in fronte lateralibus; articulis septemdecim; cauda serrata utrinque in dentibus quinque divisa

The general contour of this trilobite is that of an elongated oval; the body projects in high relief above the rock on which it reposes, and its whole length is rather more than two inches. The buckler in our specimen is partly wanting, but

the front and one of the cheeks are still in a good state of preservation, and afford a pretty accurate idea of the whole head.

The *front* rises above the surface of the cheeks, is rounded and broad at its anterior part and gradually tapers towards the middle lobe of the abdomen. It is distinctly divided from the cheeks, and has three furrows on each side, near its upper edge. The lower furrow is the longest, and is nearly on a line with the inferior edge of the oculiferous tubercles on the cheeks. The middle furrow is the smallest, and appears as a deep depression or pit. The upper furrow is rather above the superior edge of the eyes. The anterior margin of the front is marked by a long curved sulcus, which has the appearance of a *lip*, as in the Calymene of BLUMENBACH.

The *cheeks* are in the form of spherical triangles. The oculiferous prominences are close to the front, and are placed just within the internal obtuse angles. The reticulated structure of the eye is quite perfect on the lower portion of the tubercle which still remains.

We have described the above as the head of our trilobite, though it is detatched from the body; but as it lies in the rock just before and in contact with the anterior portions of the animal, there

can be little doubt that it once formed a part of it.

The articulations of the *abdomen and tail* cannot be distinguished from each other; seventeen may be readily counted, and though our specimen is not entirely perfect, this number probably includes the whole. The middle lobe is quite prominent; is nearly equal in breadth for about two-thirds of its course, and then gradually tapers to an obtuse tip. Most of the ribs, or costal arches, are, in our specimen, beautifully distinct. There is a little furrow scooped out of the upper surface, commencing at the middle lobe and terminating near their outward extremities, which are rounded and separated from each other, forming on the sides of the animal a denticulated line. Beyond these costal arches, there projects a second series of shorter ribs; these commence between the outward extremities of the first series, and gradually widen towards their termination. These appear intended to support a membranaceous expansion round the body. Unfortunately our specimen is rather obliterated on the sides, but still small curved spinous prolongations, may be seen in some places to terminate the second series of ribs, and will probably be found, in more perfect specimens, to project beyond the lateral margin of the abdomen on both sides.

The *caudal end* is very peculiar. The last five costal arches of the tail, terminate abruptly in a narrow membranaceous edge, which appears to be continuous with the expansion that surrounds the body. Its external border is finely ornamented with five leaf-like scollops on each side; the points of the leaves are free, and all curve towards a smaller leaf or lobe, which originates from the central portion of the tail or terminal joint of the vertebral column. At the fifth costal arch, counting from the tail towards the head, where the leaf-like appearance of the caudal membrane commences, the second series of ribs, which rise between the extremities of the costal arches, terminates. In our specimen, but three of the leaf-like scollops on one side remain perfect; the origin of the other two is, however, very obvious.

This magnificent trilobite was found near the town of Huntingdon, in Huntingdon County, Pennsylvania, by Professor JAMES C. BOOTH, to whose kindness I am indebted for an opportunity of describing it. The specific name is given in justice to the discoverer, whose eminent skill in geology, mineralogy, and in analytical chemistry, entitles him to a much higher distinction.

In the cabinet of my friend, Dr. R. M. S. JACKSON, there is a fragment of this species displaying the remarkable organization of the caudal end,

and a person residing at Huntingdon has another specimen; all were found in the same locality. The rock in which they occur is a ferruginous clay slate, filled with other petrifactions. My friend JOHN F. FRAZER, Esq. informs me that the geological structure of Huntingdon and its vicinity, belongs to the classification of rocks, called by Professor ROGERS, in his annual report as State Geologist, the *olive slate stratum*. This stratum reposes on a coarse grained sand stone, full of organic remains, and is thus described in the report.

"The next stratum is a dull olive coloured slate, alternating with grey argillaceous sand stones. Towards the upper portion some of the layers consists of a soft, very yellow slate, which increases as we ascend, becoming, in the upper part, the principal variety. It alternates with beds which gradually assume a brown and reddish tinge, that grows gradually more distinct, indicating the gentle passage of this rock into the red argillaceous stratum above it. The inferior layers contain occasionally large deposits of a very argillaceous iron ore, approximating in its composition and characters to the argillaceous iron stone of the coal measures. This stratum abounds also in mineral springs, the predominating ingredient of which is sulphuretted hydrogen.

It may, for convenience sake, be called the *olive slate stratum.*"

ASAPHUS *Trimblii.—Green.*

Clypeo ? Corpore depresso; costis planis, parte marginali vix membranacea; cauda rotundata? brevi.

Our fragment exhibits eleven articulations of the abdomen, and nine of the costal arches, all in a good state of preservation. It presents another example of the fact, that the ribs of the side lobes do not always correspond in number and position with the articulations of the vertebral column.

Like most of the fossil animals of this genus, the head is mutillated or lost; yet what seems to have been a small fragment of the *front* or middle lobe of the buckler, lies on the rock at a little distance from the abdomen. It is marked by two deep curved, transverse plicæ or folds.

The body is much depressed; the middle lobe is slightly conical, and terminates in a very obtuse tip; its articulations are all regularly rounded and smooth. The costal arches are also rounded, and without striæ, grooves, or pustulations, and have the same breadth throughout; the lower ribs are slightly curved, and they all terminate very abruptly in the membranaceous expansion. This organization of the Asaph is beautifully developed

in our specimen;—the membrane is narrow, even, and smooth along the sides of the body, forming a regular hem or border; at the central portions of the tail, it gradually widens and makes a short rounded projection. It is difficult to say, whether the whole caudal membrane is entirely perfect in our specimen, for their appears to be an acute point in the rock, formed by some animal remain, just beyond the rounded end of the tail. If this be a part of the animal, then the central portion of the caudal membrane is acute, and not rounded.

I am indebted to Dr. J. Trimble, of Huntingdon County, for this species. This gentleman has contributed very much to the illustration of the geology and natural history of the interesting County in which he resides, and I take pleasure in calling this species by his name. It was found by him not far from his residence, in a buff-coloured clay slate. In the possession of Professor Oliver P. Hubbard, of Dartmouth College, I examined a fine large fragment of what seemed to be our present species; but as the membranaceous expansion, if it possessed one, is broken off all round the body, we could not fully determine the question. It also occurs in yellowish limestone, and was found, in company with the Calymene *Blumenbachii*, at Juliet, in the State of Illinois.

The ASAPHUS *Trimblii* resembles, in some respects, the A. *Laticostatus*, but its depressed form, its narrow membranaceous border, and the regular breadth of its costal arches, with some other peculiarities, will on comparison, readily distinguish the two species. The A. *Laticostatus* occurs in the ferruginous sand stone, so common in rolled masses, in Ulster County, in the State of New York; and the A. *Trimblii* is mineralized in the yellow slate, which probably forms one of the layers of the olive slate stratum, so abundant in Huntingdon County, Pennsylvania. Dr. JAMES TRIMBLE has presented me with some very fine fragments of the Calymene Bufo, found by him in this locality. The reticulated structure of the oculiferous protuberances in some of them, appear as perfect, perhaps, as if the animal were in a living state.

## *Descriptions of new Marine Shells, from Upper California.* Collected by THOMAS NUTTALL, Esq. By T. A. CONRAD.

Read in January and Febuary, 1837.

Mr. NUTTALL having kindly offered me the use of his cabinet, for the purpose of describing the new species which he has recently brought from California, I have ventured, with some hesitation, to describe and figure a considerable number, unnoticed I believe in the works which are at present accessible to me. These shells are peculiarly interesting, not only from their variety and beauty, but in consequence of so close a resemblance between many of them and species of the Atlantic coast, that it requires a careful comparison to detect the difference in essential character; yet in very few instances have I seen a Californian shell which could be referred without doubt to an Atlantic species.

### PANDORA. *Lam.*

P. *punctata.* [Plate 17, fig. 1.] Shell much compressed; posterior side produced, extremity rostrated, truncated; ligament margin recurved, sub-margin carinated; within punctate; cardinal teeth three in the superior valve; in the inferior, one elongated oblique tooth. Length,* one and a half inches.

*Inhabits* in the neighborhood of Sta. Barbara. Single valves occur on the beach at the recess of the tide.

Closely resembles P. *trilineata,* Say, but differs in the punctate interior, and the tooth in the inferior valve being more oblique than in the Atlantic species.

### CARDIUM. *Lin.*

1. C. *substriatum.* [Plate 17, fig. 2.] Shell obliquely ovate, ventricose, thin, smooth; radiating striæ obsolete, except on the inferior part of the umbonial slope; colour yellowish, variegated with brown; umbo and middle of disk tinged with blue; within yellow, varied with brownish purple markings; margin finely serrate.

* The largest specimen of each species has always been selected for measurement. When this is not given, the figure is of the natural size.

*Inhabits* muddy marshes, laid bare at low water, in the vicinity of St. Diego.

Approaches C. *Mortoni* nobis; but differs in being less ventricose, and in its striæ and serrate margin.

2. C. *Nuttallii*. [Plate 17, fig. 3.] Shell ovate-triangular, ventricose, thick; ribs thirty-four, regularly rounded, with prominent arched striæ; umbo narrowed; summit very prominent; posterior slope much depressed; posterior margin straight, oblique, simply undulate; ligament margin declining; basal margin regularly arcuate; colour white; epidermis yellowish brown; lateral teeth thick and prominent; margin profoundly serrate. Height, three and a half inches.

*Inhabits* muddy salt marshes, a few miles from the estuary of the Columbia river.

3. C. *Californianum*. [Plate 17, fig. 4.] Shell suborbicular, ventricose, rather thick; ribs thirty-four, prominent, slightly flattened, with prominent arched striæ, which on the back of the ribs in the middle of the valves are obsolete, but distinct on the sides of the ribs; summit of the umbo prominent; beaks oblique; colour yellowish, with pale red spots; margin profoundly serrate within; posterior margin direct, undulate.

*Inhabits* the vicinity of Sta. Barbara. Single valves collected on the beach, and rare.

4. C. *quadragenarium*. [Plate 17, fig. 5.] Shell cordate, subequilateral, ventricose, thick; ribs forty to forty-two, prominent, subangular, flattened at the sides, with a series of small tubercles, which, on the anterior side, are largest, and placed in the middle of the ribs, but elsewhere on the posterior angular margin of the ribs; umbo broad, prominent; beaks not oblique; tubercles elevated on the posterior slope; colour pale yellow, with fulvous spots and zones; posterior margin direct, deeply serrate. Height, three inches.

*Inhabits* near Sta. Barbara; rare.

Allied to C. *Asiaticum*, but wants the lamellar ribs of that species.

## SANGUINOLARIA. *Lam.*

1. S. *Nuttallii*. [Plate 17, fig. 6.] Shell subovate, thin, much compressed; posterior margin obliquely truncate; extremity angular; basal margin regularly arcuate; beaks small, distant from the anterior margin, slightly prominent, acute; ligament short and very prominent; nympha very prominent; colour whitish, with purple zones

and rays; epidermis polished, horn coloured, with paler spots and rays; cardinal teeth prominent, slender, fragile. Length, two and a half inches.

Approaches the genus *Solecurtus*, and closely resembles S. *Nuttallii* in the colour, markings, and texture of its epidermis.

*Inhabits* marshes near Sta. Diego.

2. S. *Californiana*. [Plate 17, fig. 7.] Shell ovate, compressed, subequilateral, thin and fragile, not polished; posterior side much compressed, cuneiform; colour rosaceous.

*Inhabits* muddy marshes, near the limits of salt water, in the estuary of the Columbia.

Differs from S. *fusca* (PSAMMOBIA *fusca*, Say,) in being universally smaller, proportionally longer, and rose coloured.

Variety *A.*, white, equilateral. This may prove a distinct species.

### SOLECURTUS. *Blainville.*

1. S. *lucidus*. [Plate 17, fig. 8.] Shell oblong, oval, compressed, thin, fragile, translucent; posterior extremity nearly direct, truncated; colour blueish, with purple concentric zones, and two oblique pale rays on the posterior side; interior rib nearly direct.

*Inhabits* the sand-beach, near Sta. Barbara; uncommon.

The rib shows very distinctly through the substance of the shell, resembling a yellowish ray.

2. S. *Nuttallii.* [Plate 17, fig. 9.] Shell oblong-oval, thin, fragile, compressed; posterior margin more obtusely rounded than the anterior; colour white, obscurely rayed; epidermis horn colour, with paler spots; beaks purple; cardinal teeth two in the right valve, lamellar, remote; in the left valve four; rib broad, oblique. Length, four and a half inches.

*Inhabits* salt marshes, somewhere towards Point Adams, in the estuary of the Columbia.

Resembles S. *costatus,* Say; but is far larger, with different teeth, and a more oblique rib. Near the posterior extremity are some oblique wrinkles.

### *Subgenus* Cultellus, *Nob.*

Shell convex, with the hinge and basal margins parallel; subequal at the extremities; teeth generally two in each valve; no distinct interior rib.

This subgenus includes a group of shells which are strikingly dissimilar to the true Solecurtus in outline, and gaping more at the ex-

tremities. It includes S. *caribæus*, *Dombeii*, *strigillatus*, and others.

3. S. *subteres*. [Plate 17, fig. 10.] Shell linear-oval, inflated or subcylindrical, slightly arcuate; beaks central, very obtuse, extremities equally rounded; colour pale purple, obscurely rayed; epidermis yellowish brown, finely wrinkled; teeth two in each valve; posterior tooth of the right valve dilated. Length, two and a quarter inches.

*Inhabits* in the vicinity of Sta. Barbara.

4. S. *Californianus*. [Plate 18, fig. 3.] Shell oblong-oval, rather thin, convex; extremities equally rounded; basal margin slightly contracted in the middle; beaks central; colour white, tinged with yellowish brown, and marked with direct brown lines in the middle of the valves; epidermis straw colour, with radiating wrinkles on the posterior slope. Length, three and a half inches.

*Inhabits* muddy salt marshes, in the neighbourhood of Sta. Barbara; common.

Closely related to S. *caribæus* and S. *Dombeii*, Lam. It is proportionally less elevated than the former, and has a less prominent nympha. The direct brown lines commonly produce perceptible ridges within the shell.

### SPHÆNIA. *Turton.*

S. *Californica.* [Plate 17, fig. 11.] Shell sub-oval, convex-depressed, with radiating striæ; obscure, except towards the posterior extremity, where they are distinct; posterior margin obliquely truncated, rectilinear; beaks central, ligament margin arcuate; tooth much dilated, oblique; colour white; palleal impression without a sinus, but forming a right angle posteriorly.

*Inhabits* salt marshes, near Sta. Barbara; rare.

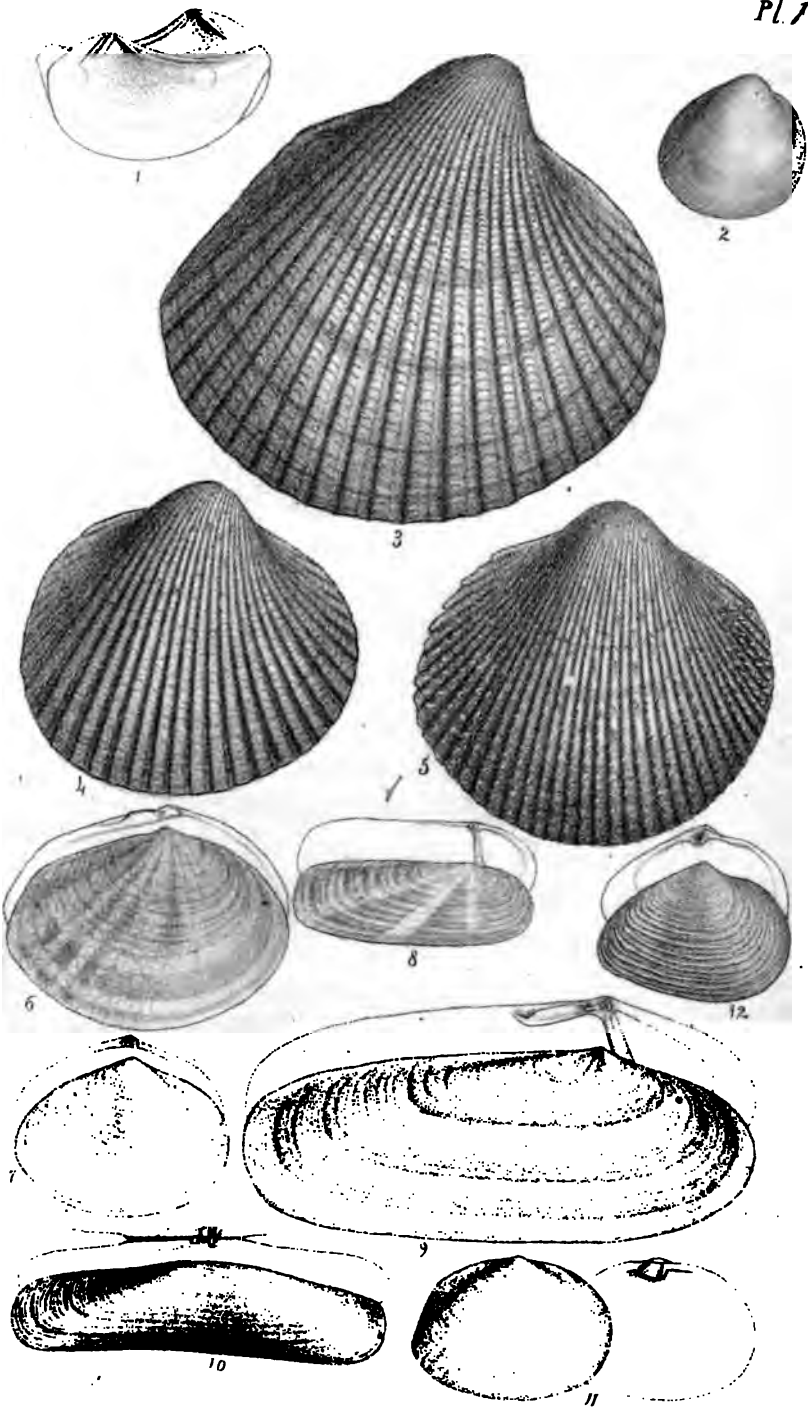
The form of the palleal impression and the valves being nearly or quite closed, prove that the organization of the animal inhabiting this shell differs from that of MYA; to which, however, SOWERBY reunites the genus *Sphænia* of TURTON.

### CUMINGIA. *Sowerby.*

C. *Californica.* [Plate 17, fig. 12.] Shell triangular, convex, thick, with numerous irregular lamellar concentric striæ; posterior side compressed, cuneiform; beaks central, rather prominent; lateral teeth prominent. Length, one inch and one-fourth.

*Inhabits* with the above; rare.

Allied to C. *tellinoides*, Nob.; but is larger, thicker, and has a less projecting cardinal fosset.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## LUTRARIA. *Lam.*

### *Subgenus* CRYPTODON, *Nob.*

Shell with the general aspect and character of Lutraria, but deeply channelled along the hinge margin; the animal with two syphons, bearing at the extremity two corneous valvular appendages, which close the orifices of the tubes.

L. *Nuttallii.* [Plate 18, fig. 1.] Shell elliptical, slightly gibbous from beak to base; posterior side produced; ligament margin slightly declining, rectilinear, extremity obliquely subtruncated; umbo prominent; colour white; epidermis very thin, brown, wrinkled on the margins. Length, six inches.

*Inhabits* salt marshes, bare at low water, in the vicinity of Sta. Barbara.

## MYA. *Lam.*

### *Subgenus* PLATYODON, *Nob.*

Shell resembling the true Myæ, but with a less prominent and more dilated tooth; palleal impression slightly sinuous anteriorly; posterior sinus profound; animal with two syphons bearing at the

extremity four testaceous valvular appendages which close the orifices of the tubes.

M. *cancellata.* [Plate 18, fig. 2.] Shell subelliptical, ventricose, with numerous prominent, slightly undulated concentric striæ; a slight furrow extends from beak to base; posterior side with radiating striæ; obsolete, or wanting on the posterior slope; umbo prominent; posterior side short; cardinal tooth very erect, dilated, biemarginate. Length, three inches.

*Inhabits* muddy marshes and soft rocks, near Sta. Barbara, &c.

### Cypricardia. *Lam.*

C. *Californica.* [Plate 18, fig. 4.] Shell oblong, ventricose, with decussating striæ; the concentric lines thick and rugose towards the anterior extremity; posterior side dilated, extremity obtusely rounded; ligament margin elevated; beaks nearly terminal; umbonial slope carinated. Length, one and a half inches.

*Inhabits* soft argillaceous rocks, which are bare at low water, with the Pholades, in the vicinity of Sta. Diego and Sta. Barbara.

### Pholas. *Lin.*

1. P. *Californica.* [Plate 18, fig. 5.] Shell elongated, with eight accessory valves; two of

which are on the basal margin, extending nearly its entire length; anterior side gibbous, with the concentric lines lamellar, crowded, undulated, and crossed by numerous impressed lines; valves much contracted submedially, with an oblique groove; umbonial slope angulated; posterior side with elevated laminæ; extremity truncated; apophysis oblique, dilated; hinge margin within greatly thickened posteriorly. Length, four inches.

*Inhabits* soft rocks with the above.

Remarkable for the number of its valves; and the only species we know with valves on the basal margin.—Fig. 7 represents a tube formed of indurated clay by the animal to protect itself from the influx of sand or mud, this tube extending nearly to the surface of the bed in which the animal burrows.

2. P. *penita.* [Plate 18, fig. 7.] Shell ovate, elongated, contracted submedially and grooved; anterior side inflated, with decussating lines, the radiating striæ having a granulated appearance, posterior side subcuneiform, extremity truncated, with a membranous expansion or appendage; apophysis oblique, slender, spoon shaped at the extremity.

*Inhabits* with the preceding.

Resembles the foregoing species, but is much less; the apophysis very different, and the posterior hinge margin is not callous within.

### Periploma, *Schum.*

P. *argentaria.* [Plate 18, fig. 8.] Shell elliptical; posterior side short, subangulated, slightly reflected, extremity nearly direct, truncated; beaks rather prominent; apophysis produced, very oblique; nacre silvery. Length, two inches.

*Inhabits* muddy marshes of the sea-coast and also probably the sand beaches near the entrance of the harbour of Sta. Diego.

### Pecten.

1. P. *latiauratus.* [Plate 18, fig. 9.] Shell inequilateral, thin, compressed; ribs fourteen, flattened on the back, slightly sulcated; interstices transversely striated; ears very wide, unequal, both acutely angulated at the extremity; colour reddish brown and white, variegated or spotted.

*Inhabits* below the efflux of the tide near Sta. Diego and Sta. Barbara.

2. P. *Monotimeris.* [Plate 18, fig. 10.] Shell ovate, oblique, thin, compressed, with concentric

striæ; ribs thirteen, rounded; ears subequal; colour brown, with white stripes and spots.

Variety *A*. Orange, with white divaricating stripes.

*Inhabits* with the preceding. The young occasionally found attached to *Fuci* by a slender byssus.

### Amphidesma.

1. A. *rubro-lineata*. [Plate 18, fig. 11.] Shell subtriangular, moderately thick; posterior side narrowed, folded, extremity truncated; beaks central; colour yellowish, with pale red rays; anterior and posterior lunules purple; within tinged with purple in the middle; lateral teeth distinct.

*Inhabits* deep water in the vicinity of Sta. Diego.

2. A. *decisa*. [Plate 19, fig. 2.] Shell suborbicular, thick, with thick concentric rugose slightly prominent ribs; posterior side shorter than the anterior, direct, biangulated; fold distinct; beaks elevated; colour yellowish with faint red rays, generally obsolete or wanting; within bright rose red fading into white in the centre; lateral teeth distinct in each valve.

Length, five inches.

*Inhabits* with the preceding.

A. *bellastriata*. [Plate 20, fig. 4.] Shell

elliptical, compressed; anterior margin very regularly rounded; posterior side with a slight fold; disk with numerous prominent not very regular concentric striæ, and obscure radiating lines, which are profound near the anterior and posterior extremities; beaks rather nearer the posterior extremity; lateral teeth prominent, distinct in both valves; margin entire.

*Inhabits* Mobile Point, Alabama. Occurs sparingly in the *Newer pliocene* marl, near Newbern, N. C.

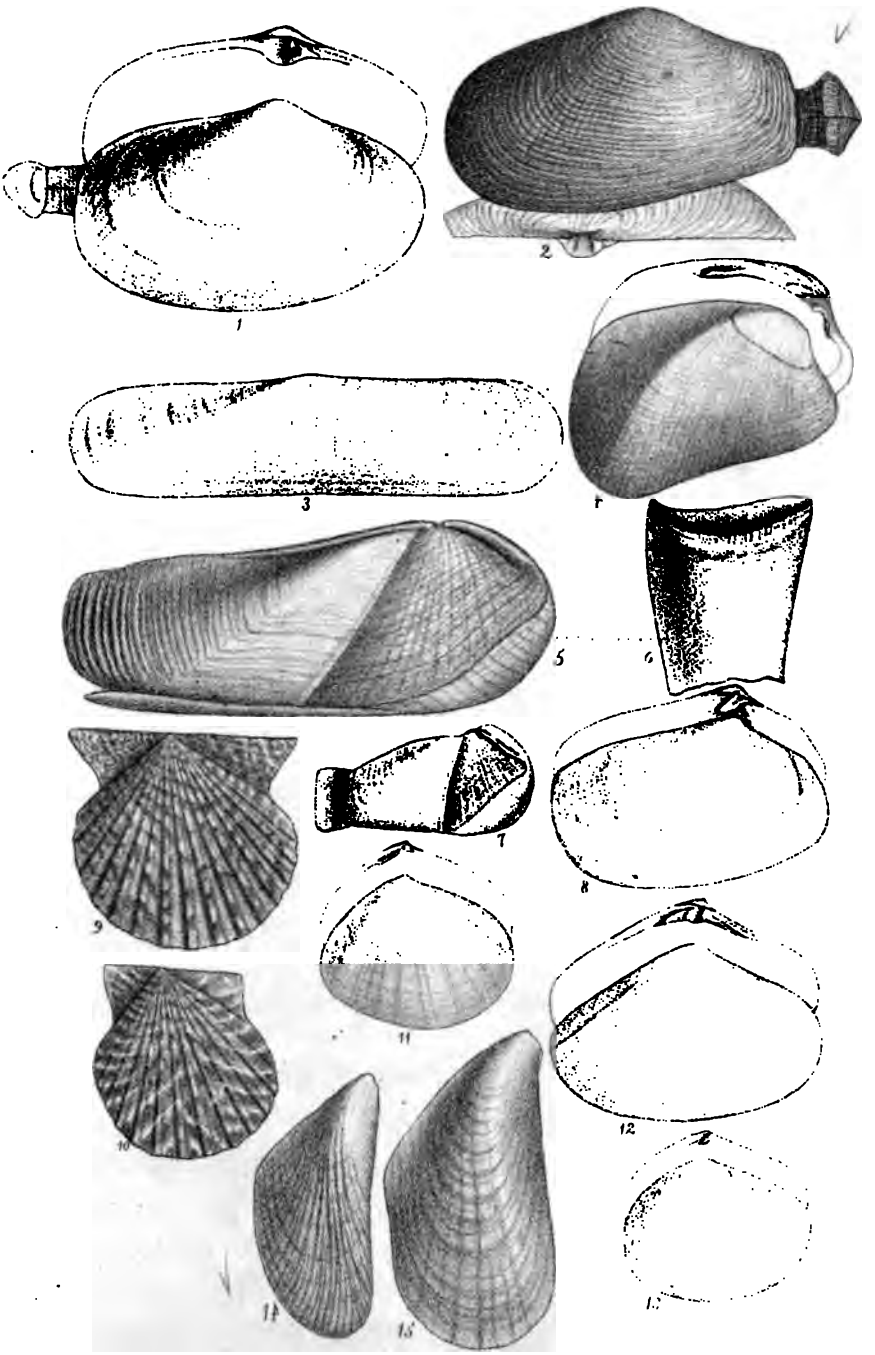
MACTRA. *Lin.*

1. M. *Californica.* [Plate 18, fig. 12.] Shell triangular, compressed, equilateral; posterior margin rectilinear; posterior side with a carinated, rectilinear, submarginal line; beaks prominent, sulcated; epidermis brown, with concentric wrinkles; teeth lamellar, large, very prominent.

*Inhabits* muddy marshes, bare at low water, near Sta. Barbara; rare.

2. M. *planulata.* Shell triangular, much compressed, subequilateral; the posterior side rather shorter than the anterior; anterior side subcuneiform; posterior side with an obscure submarginal line, extremity rounded; beaks elevated; epidermis smooth, shining. Length, one inch and three-fourths.

*Inhabits* with the former.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This species may be distinguished from the preceding, by its larger size, and more compressed form, shining epidermis, and particularly by the much smaller proportional size of its *V* formed cardinal tooth.

### Psammobia. *Lam.*

1. P. *pacifica.* [Plate 18, fig. 13.] Shell suboval, convex, with very obscure, radiating lines; posterior side rather shorter than the anterior, margin direct, slightly arcuate; colour generally purple, with darker zones and two pale rays on the posterior side.

Variety *A.* Yellowish, with purple rays; also sometimes wholly white, pale rose, or flesh colour.

*Inhabits* in deepish water on a sandy bottom, near Sta. Diego.

### Mytilus. *Lin.*

1. M. *bifurcatus.* [Plate 18, fig. 14.] Shell narrowed, slightly arcuate; anterior margin much flattened; ribs narrow, prominent, bifurcated towards the base; colour dark purple. Height, one and a half inches.

*Inhabits,* attached to rocks bare at low water, in the Sandwich islands, (Ouau, &c.)

2. M. *Californianus.* [Plate 18, fig. 15.] Shell ovate elongated, inflated; anterior margin straight; posterior side emarginate; ribs not very numerous, slightly prominent, broad, rounded; lines of growth very prominent. Length, two inches and one-eighth.

*Inhabits* on rocks, near Sta. Diego and Sta. Barbara, as well as at Monterrey.

MYTILUS *crebristriatus.* Shell produced, narrow, with crowded, fine radiating striæ; beaks contracted, posterior margin direct, slightly emarginate; base slightly dilated, regularly rounded, within brownish purple; margins crenulated; hinge margin deeply crenulated. Length, one and a half inches.

*Inhabits* muddy marshes in the Sandwich Islands.

Closely resembles M. *Modiolus,* (M. *cubitus,* Say,) but may be distinguished by a more profoundly crenulated hinge, the less salient angle of the posterior termination of the hinge margin, and a broader base.

## MODIOLA. *Lam.*

1. M. *capax.* Shell much inflated; anterior margin slightly retuse in the middle; umbo

broad; summit obtusely rounded; posterior margin salient in the middle; epidermis chestnut brown, fibrous at base; within blueish, tinged with yellow. Length, three inches.

*Inhabits* marshes and muddy shores about Sta. Diego.

This species is intermediate between M. *papuana*, and M. *Americana*, Leach; it most nearly resembles the latter, but may be distinguished by its deep chestnut brown epidermis, which is destitute of rays; the umbo is broader and more prominent; and the summit of the anterior margin is less prominent, and more obtusely rounded.

2. M. *recta*. [Plate 19, fig. 1.] Shell produced, smooth, thin; anterior margin elevated; posterior side cuneiform; colour brown, with a broad pale stripe extending from the beak towards the posterior margin; within very glossy and iridescent. Length, two inches.

*Inhabits* sandy shores near Sta. Barbara; rare.

3. M. *Carolinensis*. [Plate 20, fig. 6.] Shell dilated in the middle, disks with very numerous small radiating striæ; inferior margin rounded; colour greenish yellow; within yellowish, spotted with purple; inferior margin beautifully crenulated.

*Inhabits* the coast of Sullivan's Island, near Charleston, S. C., where I found it in the winter of 1832.

4. M. *semi-costata.* [Plate 20, fig. 7.] Shell much elevated or produced from beak to base; narrowed above; disks with radiating ribs, some of which bifurcate at base; anterior superior portion of the valves finely striate, colour blueish purple; epidermis brown; within purple inferiorly; blueish and yellowish above.

*Inhabits* the coast of Massachusetts, near Salem.

This species can readily be distinguished from M. *Demissa,* (M. *plicatula,* Lam.) by its purple colour, the larger size of the ribs, and much more contracted form of the valves near the beaks. Found in abundance by Mr. NUTTALL.

## PINNA, *Lin.*

1. P. *Nuttalli.* [Plate 19, fig. 4.] Shell produced, smooth, thin, horn coloured; anterior and posterior margins nearly parallel; disk with about five prominent undulated plicæ; anterior margin truncated. Length, eight inches.

*Inhabits* muddy marshes in the Sandwich Islands; rare.

2. P. *semi-costata*. [Plate 20, fig. 11.] Shell narrow-cuneiform, dilated at base, smooth; basal margin straight; posterior side costate; anterior side with concentric sulci; interstices of the ribs transversely striate; colour yellowish; greenish, and iridescent towards the apex. Length, three and a half inches.

*Inhabits* with the preceding.

## Perna. *Lam.*

1. P. *incisa*. [Plate 19, fig. 9.] Shell sub-ovate, dilated inferiorly; disks with obsolete radiating striæ at base; hinge with from three to five teeth; colour dark purplish brown; within highly polished; pale, variegated with dark, purplish brown. Height, two inches.

*Inhabits* the shores of the Sandwich Islands.

2. P. *Californica*. [Plate 19, fig. 13.] Shell compressed, thin, fragile; hinge margin elongated, straight; posterior margin direct, emarginate; colour blue or purplish, with a dark brown, almost black subradiated epidermis. Height, one and a quarter inches.

*Inhabits* with the preceding.

P. *costellata.* Shell much elevated, or produced from beak to base; very much compressed; disks with radiating tuberculated striæ; colour yellowish. Height, two and a quarter inches.

*Inhabits* the Sandwich Islands, under stones.

### Avicula. *Lam.*

1. A. *pallida.* [Plate 19, fig. 6.] Shell subquadrate, compressed; wings small; colour white, epidermis tinged with yellowish; within shining with a splendid silvery lustre.

*Inhabits* the Sandwich Islands, accompanying the Pernas; rare.

2. A. *nebulosa.* Shell convex, inferior valve inflated; ears large; colour yellowish, clouded and radiated with brown; epidermis with lamelliform serrated concentric wrinkles, the points of the wrinkles white, and disposed in form of rays; within highly iridescent, with a broad brown spotted margin; cardinal and lateral teeth distinct.

*Inhabits* the Sandwich Islands, particularly abundant near Pearl river, in Wahoo.

Resembles a species common on the Florida coast.

### Mytilimeria. *Conrad.*

*Generic character.* Shell equivalve, suboval,

thin; beaks subspiral; hinge edentulous, with a slight linear cavity under the beaks; muscular impressions two, rather small; palleal impression with a broad obtuse sinus.

M. *Nuttalli.* Shell suboval, inflated, thin, fragile; white, with a very thin, yellowish, deciduous epidermis.

*Inhabits* the coast of California, in sponge, and thrown up, attached to the roots of fuci, in deep water.

It differs from MYTILUS and MODIOLA essentially in the form and position of the muscular impressions, and in the sinus of the palleal impression; the anterior muscular impression is placed much more remote from the apex than in the two allied genera.

## LIMA. *Lam.*

L. *dehiscens.* [Plate 19, fig. 7.] Shell elliptical, with radiating striæ; on one side profoundly gaping; margin of the hiatus thickened within, subreflected exteriorly; ears very small, on the gaping side acutely pointed.

*Inhabits* the rocky coast of the island of Fayal; rare.

### THRACIA. *Blain.*

T. *curta.* [Plate 19, fig. 8.] Shell suboval; anterior margin obtusely rounded; posterior margin direct, subrectilinear; umbonial slope angulated.

*Inhabits* the Coast of California, near Sta. Barbara.

One valve only is in Mr. NUTTALL's cabinet, but this is widely distinct from any species hitherto described.

### LYONSIA. *Turton.*

1. L. *inflata.* [Plate 19, fig. 10.] Shell subelliptical, inflated; concentric rugæ distinct; ligament margin concave; basal margin gibbous; posterior extremity truncated; cardinal appendage dilated.

*Inhabits* Guayaquil. Dr. BURROUGH.

A specimen is in the collection of the Academy.

2. L. *Californica.* [Plate 19, fig. 21.] Shell produced, equivalve; posterior side narrowed, truncated at the extremity; umbo inflated; epidermis with radiating striæ. Length, one and a half inches.

*Inhabits* the coast of California, near Sta. Barbara.

When young, it resembles L. *hyalina*, Nob. of the Atlantic coast of the United States, but is more elongated, proportionally.

### SAXIDOMUS. *Conrad.*

*Generic character.* Shell equivalve, gaping posteriorly; hinge with from four to five compressed cardinal teeth in the right valve; in the left valve, four; muscular impressions two, large, rounded; palleal impression with a profound sinus.

This genus differs from PULLASTRA, Sowerby, in its gaping extremity, and in the rounded form of the sinus of the palleal impression. I presume the animal also differs in its habits from that of PULLASTRA, as Mr. NUTTALL found it in cavities of the rocks, which it seems to have perforated.

S. *Nuttalli.* [Plate 19, fig. 12.] Shell suboval; disk rough, with concentric striæ, elevated on the posterior slope; posterior extremity truncated; colour white, with brown spots and stripes about the umbo and ligament margin. Length, two inches.

*Inhabits* the coast of California and Sta. Diego, burrowing into soft clay-stone accompanying the PHOLADES, CUMINGIÆ, &c.

### VENUS.

1. V. *Nuttalli.* [Plate 19, fig. 14.] Shell triangular, equilateral, convex-depressed, thick; disks with radiating flattened ribs, with an alternating line in the interstices, and remote reflected concentric ribs, about fourteen in number; colour white; cardinal teeth large, thick; margin crenulated; near the posterior extremity is a purple spot. Length, two inches.

*Inhabits* the coast of California, Sta. Barbara, and Sta. Diego.

2. V. *staminea.* [Plate 19, fig. 15.] Shell suboval, or suborbicular, convex, with numerous crowded radiating striæ, and finer concentric lines, most distinct on the anterior side; posterior extremity direct; ligament margin nearly parallel with the base; colour variegated with yellowish and brown, and with brown angular spots; cardinal teeth compressed; sinus of palleal impression profound. Length, one and a half inches.

*Inhabits* the coast of California, with the above.

3. V. *Californiana*. Sow. [Plate 19, fig. 15.]

*Inhabits* the coast of California, in muddy marshes near Sta. Diego.

4. *lamellifera*. [Plate 19, fig. 19.] Shell subovaL, compressed; disks with about eight lamelliform concentric slightly reflected ribs, and very obscure radiating sulci; posterior extremity widely truncated; colour white; palleal impression with a profound sinus.

*Inhabits* the coast of California, with the preceding. Very rare; a single valve only was found.

VENUS *Mortoni*. Shell cordate, inflated, thick and ponderous, with prominent recurved concentric laminæ, more elevated on the anterior and posterior margins; ligament margin arcuate; umbones prominent; lunule large, cordate, defined by a deep groove; posterior extremity slightly emarginate; cavity of the cartilage profound; teeth large, prominent, grooved; muscular impressions very large; inner margin regularly crenulated.

*Inhabits* Charleston harbor, South Carolina. This large VENUS occurs abundantly in the *newer pliocene*, on the plantation of Mr. BENNERS, in Craven County, North Carolina, and many specimens may be collected on the margin of the

Neuse, where they have been cast by the waves. The only recent specimen I have seen, was obtained in Charleston harbor, and is now in the collection of the Academy of Natural Sciences. It is a much larger species than the VENUS *mercenaria*, is proportionally shorter, and may be distinguished in every stage of growth by the prominent laminæ covering the whole disk, which, when worn, presents a ribbed or sulcated surface. The largest I have seen is in possession of H. B. CROOM, Esq., and measures about six inches in length.

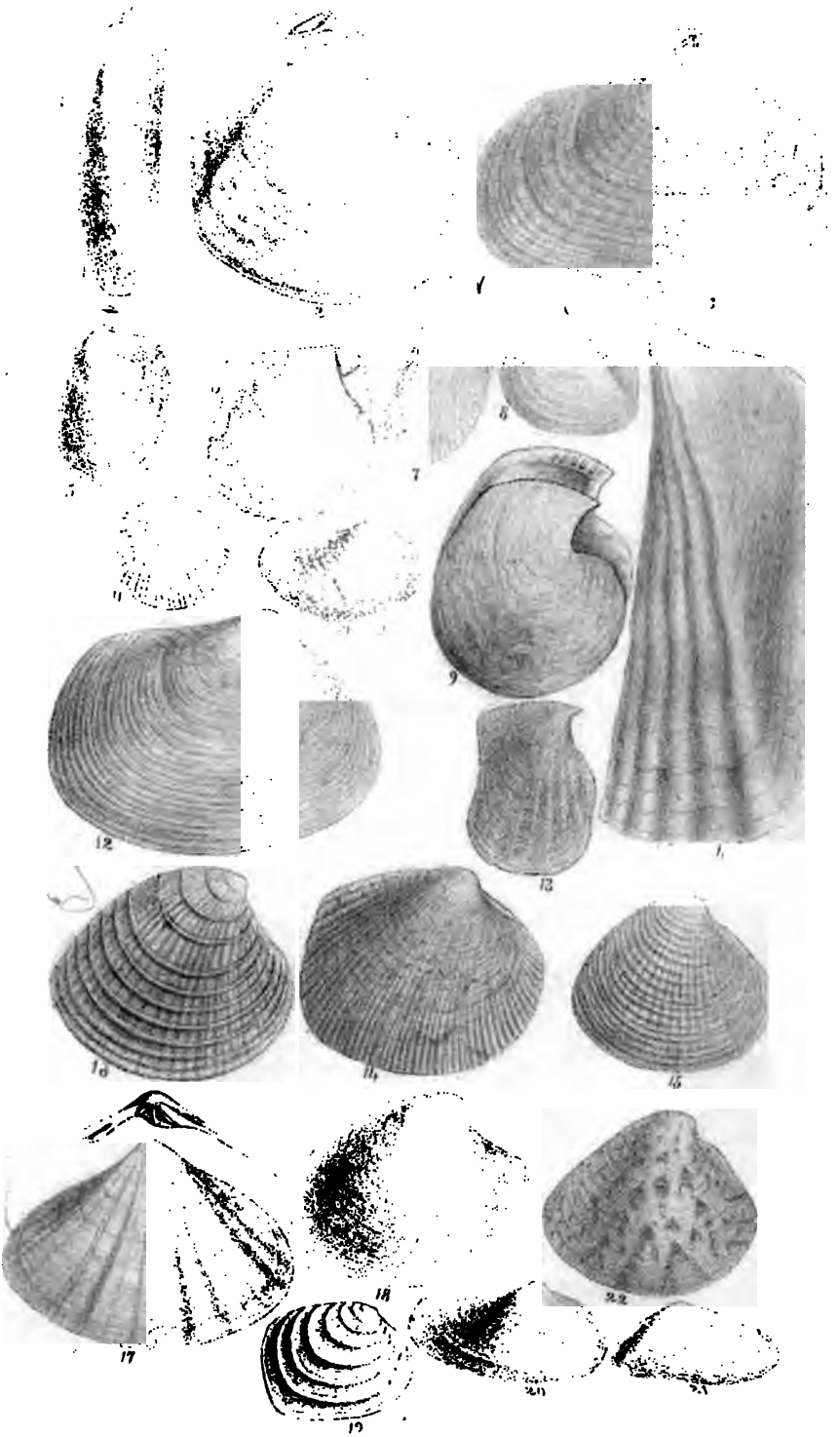
It is named in compliment to Dr. S. G. MORTON.

### CYTHEREA. *Lam.*

1. C. *callosa*. Shell subovate, convex-depressed, white; valves with numerous concentric flattened ribs, some of which are divided or interrupted on the anterior and posterior sides; valves irregularly thickened in the interior, except near the margins; palleal impression very distinct, and the sinus profound. Length, two inches.

*Inhabits* the coast of California near Sta. Barbara; rare.

Resembles the fossil C. *erycinoides*, but is remarkably distinct in the callous or thickened interior.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2. C. *prora*. [Plate 19, fig. 18.] Shell inflated, polished; anterior side subcuneiform, sharply angulated at the extremity, which is much elevated; superior margin straight or slightly concave; lunule very slightly impressed, bounded by a broad indistinct carina; colour white. Length, one inch and three quarters.

*Inhabits* the Pacific, probably towards the coast of New Holland.

3. C. *hieroglyphica*. [Plate 19, fig. 22.] Shell subtriangular; disks with concentric striæ distinct on the margins but obsolete in the middle; posterior side subcuneiform, extremity rounded; lunule cordate, simply defined by an impressed line. Colour white, frequently marked with brown spots of a triangular form. Length, one inch and a third.

*Inhabits* the Sandwich Islands, in muddy marshes near Pearl river.

Sometimes confounded with C. *castrensis*, but is much smaller, and more produced posteriorly.

*Subgenus* TRIGONELLA. *Nob.*

4. C. *crassatelloides*. [Plate 19, fig. 17.] Shell equilateral, triangular, thick; convex-depressed; lunule undefined; posterior extremity truncated; ligament short, very broad and elevated; apex very prominent; beaks not oblique; colour whitish,

frequently rayed with brown; cardinal teeth very thick and prominent; anterior tooth elongated, thick; sinus of palleal impression angular.

Length, seven inches.

*Inhabits* the coast of California about a foot deep in the sand—abundant round Sta. Diego as well as near Sta. Barbara.

### DONAX. *Lin.*

D. *Californica.* [Plate 19, fig. 21.] Shell elongated, somewhat pointed at both extremities; disks with very minute radiating lines; colour yellowish, obscurely rayed; a brown stripe on the anterior and posterior submargin; within white and purplish brown; margin beautifully crenulated.

*Inhabits* the coast of California in sand, near Sta. Barbara.

### LUCINA. *Lam.*

1. L. *bella.* [Plate 19, fig. 11.] Shell suborbicular, equilateral, convex; disks with radiating ribs, some of which are bifurcate; concentric striæ very regular, minute; ribs smallest on the centre of the valves; cardinal and lateral teeth distinct; inner margin obsoletely crenulated.

*Inhabits* muddy marshes near Sta. Diego; common.

2. L. *Californica.* [Plate 20, fig. 1.] Shell lenticular, with coarse concentric striæ; posterior extremity direct; lunule small, elliptical, impressed, transversely striated, prominent in the right valve, and fitting into a corresponding depression in the left; cardinal and lateral teeth prominent.

*Inhabits* the coast of California with the above, but rare.

The lunule in the shell is remarkable for forming a distinct tooth, and the shell is destitute of a fold.

3. L. *Nuttalli.* [Plate 20, fig. 2.] Shell lenticular, slightly compressed; disks cancellated; concentric lines very regular, lamelliform, prominent; anterior fold small, marginal; extremity emarginate above; cardinal and lateral teeth distinct; inner margin minutely crenulated.

*Inhabits* California, with the above.

### Saxicava. *Bellev.*

1. S. *carditoides.* [Plate 20, fig. 8.] Shell oblong-oval; disks with minute radiating lines; ligament margin straight, parallel with the basal margin; posterior extremity direct; cardinal teeth prominent. Length, an inch and a half.

*Inhabits* California near Sta. Barbara, where a single valve only was collected.

2. S. *Californica.* [Plate 20, fig. 9.] Shell ovate-elongated; posterior side subcuneiform, extremity subtruncated; cardinal teeth two in each valve, prominent.

*Inhabits* California near Sta. Barbara and Sta. Diego.

The cardinal teeth in both these SAXICAVÆ are uncommonly distinct.

## CHAMA. *Lin.*

1. C. *iostoma.* Shell dextral, elliptical, very thick, eroded; lamellæ of the inferior valve prominent, plicated; lamellæ of the superior valve more crowded, with smaller plicæ and lobed on the right margin; posterior side sulcated; within whitish, with a broad dark purple margin; teeth deeply sulcated; margin entire. Height two inches.

*Inhabits* the island of Atooi, on rocks bare at low water; not common.

2. C. *exogyra.* Shell obliquely affixed, sinistral; lamellæ of the valves prominent, deeply lobed; colour white, tinged with red and green;

within white, margin entire; posterior muscular impression profoundly elongated.

*Inhabits* the rocks along the coast of upper California, near Sta. Barbara, Sta. Diego, &c.

### VULSELLA.

V. *Nuttalli.* [Plate 20, fig. 10.] Shell very irregular; disks with lamellar concentric striæ on the superior portion; cavity of the interior deeply concave above, bounded inferiorly by an elevated concentric carina; the interior is divided inferiorly by an oblique obtuse rib.

*Inhabits* the Friendly Islands, parasitic in a large species of SPONDYLUS.

### TELLINA. *Lin.*

1. T. *secta.* Shell triangular or subelliptical, equilateral, compressed, thin, smooth and polished, covered with a very thin shining yellowish epidermis; umbonial slope angulated; posterior extremity broadly and obliquely truncated; cartilage short, thick, inserted on an elongated oblique rib-like callous; margin beneath the cartilage with an ovate gape, appearing as if cut or broken, colour white within and without. Length, two inches. Height an inch and a quarter.

*Inhabits* muddy marshes; Sta. Diego.

2. T. *alta*. Shell suboval, approaching to suborbicular, slightly ventricose, rather rough and unpolished with distinct prominent lines of growth; anterior extremity obtusely rounded; posterior side of the deeper valve biangulated; the opposite valve with an angular groove; margin broad, direct, slightly emarginate at the extremity, inferiorly; beaks central; colour white tinged with yellow; cardinal plate broad; teeth long and prominent. Length, an inch and three quarters. Height an inch and a half.

*Inhabits* coast of California, near Sta. Barbara.

It has nearly the outline of a shell figured in the Ency. Method. under the head of CAPSA, Pl. 231, fig. 1.

3. T. *nasuta*. Shell ovate, compressed, smooth but not polished; anterior side dilated; posterior side cuneiform, extremity truncated, much above the line of the base; fold carinated on the superior valve; beaks central, slightly prominent; epidermis extremely thin and deciduous, finely wrinkled, brown; palleal impression of the left valve joining the anterior cicatrix at its lower pos-

terior angle. Length, an inch and three quarters. Height an inch and a third.

*Inhabits* coast of California near Sta. Diego.

4. T. *dispar*. Shell elliptical, compressed, equilateral, white, tinged with rose colour on the superior margin; polished, with minute concentric and radiating lines; concentric lines slightly undulated near the base of the larger valve; lesser valve with oblique minute lines becoming undulated and joining the concentric lines near the posterior extremity; muscular impressions very distinct, impressed. Length, one inch and an eighth.

*Inhabits* the Sandwich Islands.

5. T. *obliquilineata*. Shell small, elliptical, inequilateral, much compressed; rose coloured; posterior side cuneiform, extremity obtusely angulated; valves marked with regular numerous minute oblique lines. Length, three-quarters of an inch.

*Inhabits* Sandwich Islands.

*Tellina lintea*. [Plate 20, fig. 3.] Shell subtriangular, compressed, rather thick in substance, with prominent acute concentric lines; anterior side with a groove separated from the margin by

a carinated line, and obliquely striated; margin very oblique and rectilinear; extremity subrostrated and truncated; anterior side dilated, margin regularly rounded; beaks small, acute, not central; lateral teeth distinct.

*Inhabits* Mobile Point; Alabama.

A common species in the *newer pliocene* sands near Newbern, N. C.

### HINNITA. *Def.*

H. *Nuttalli.* Shell with crowded squamose radiating striæ, alternated in size on the superior valve; ears unequal; inferior valve ventricose, with prominent compressed ribs, armed with elevated, erect lamellar spines; cardinal fosset in the inferior valve margined on each side with a callous; colour red and yellowish, disposed in form of concentric zones on the superior valve; inferior valve yellowish. Length, seven-eighths of an inch.

*Inhabits* coast of Fayal.

One specimen only was obtained, and this appears to be a young shell. The hinge has some resemblance to that of a SPONDYLUS, and it is most probable that the animal of HINNITA has more affinity to the latter than to that of PECTEN; we, therefore, agree with Mr. GRAY, in referring the present genus to the family SPONDYLIDÆ.

### POLLICIPES, *Leach.*

P. *Mortoni.* [Plate 20, fig. 5.] Peduncle covered with minute scales; valves very numerous; base with a fringe of very minute valves.

*Inhabits* the coast of California, near Sta. Barbara and Sta. Diego.

This singular POLLICIPES differs widely from other known species, and is very remarkable for the great number of small valves at base. It is dedicated to my friend Dr. S. G. MORTON.

### EURAPHIA. *Nob.*

Shell sessile, composed of six valves joined by two sets of serrated sutures; one interior, the other exterior; base and opercular valves as in BALANUS.

E. *Hembeli.* [Plate 20, fig. 6.] Shell patulous; anterior valve with a broad flat transversely striated groove, and profoundly striated transversely on the interior; larger pair of opercular valves with transverse elevated acute striæ. Length, two inches.

*Inhabits* the coast of California, near Sta. Diego.

This singular genus is very distinct from BALA-

NUS. The valves overlap and are joined by serrated sutures exteriorly; and the two lateral valves have a central very prominent carina within, against which the two terminal valves rest.

The opercular valves are four. The two larger pair have each a distinct muscular impression, and three impressed longitudinal lines on the exterior.

The species is named in honor of WILLIAM HEMBEL, Esq., Vice-President of the Academy of Natural Sciences of Philadelphia.

Mr. NUTTALL obtained only two specimens of this extraordinary multivalve.

### ANATIFA. *Lam.*

1. A. *carinata.* [Plate 20, fig 16.] Shell small; ventricose; valves profoundly carinated on the posterior margin; disks with fine radiating striæ.

*Inhabits* the coasts of the Sandwich Islands.

2. A. *engonata.* [Plate 20, fig. 15.] Shell compressed; larger valves with a straight carina on the posterior submargin, and radiated with fine striæ; inferior valves narrow-cuneiform, pointed; at the larger extremity triangular.

*Inhabits* the coasts of the Sandwich Islands.

3. A. *substriata.* [Plate 20, fig. 14.] Shell

compressed, smooth; valves with numerous obsolete radiating striæ; posterior submargin of the valves angulated but not carinated.

*Inhabits* the coast of Fayal.

4. A. *hirsuta.* Shell small, compressed; inferior valves proportionally very large; valves with minute granulated striæ, and covered with a strong hirsute epidermis. Length one-fourth of an inch.

*Inhabits* the coast of Fayal on fuci.

### Scalaria. *Lam.*

S. *turbinata.* [Plate 20, fig. 26.] Shell with the body whirl dilated; ribs lamellar, strong, very prominent, slightly reflected, terminating above in a prominent angle; colour white.

*Inhabits* the coast of North Carolina near Beaufort, in deep water. Mr. Nuttall.

### Murex. *Lin.*

### *Subgenus* Cerostoma. *Nob.*

Shell as in the genus Murex; labrum with an erect tooth as in Monoceros.

The shell which gives origin to this subgenus,

bears precisely the same relation to MUREX, that MONOCEROS bears to PURPURA.

M. (*cerostoma*) *Nuttalli*. [Plate 20, fig. 22.] Shell fusiform, whirls with three prominent obtuse varices, carinated on the back, and lamellar at base; aperture elliptical; submargin of the labrum toothed; channel of the beak concealed; colour brown, with a white band on each whirl; within white.

*Inhabits* coast of California; Sta. Barbara.

## PURPURA. *Lam.*

### *Subgenus* MONOCEROS. *Lam.*

1. P. (*Monoceros*) *engonata*. [Plate 20, fig. 17.] Shell fusiform, whirls with a salient angle; flattened above; spirally sulcate; sulci with transverse lamellar striæ; the third whirl from the apex longitudinally costellate; colour pale, with angular dark brown spots; within white, with two or three purple spots; tooth very slender.

*Inhabits* coast of California; Sta. Barbara.

2. P. (*Monoceros*) *brevidens*. Short-fusiform, thick, spirally sulcated; tooth short, rather thick; within white.

*Inhabits* coast of California; Sta. Barbara.

Very like the preceding, but has a shorter spire, is destitute of the salient angle of the whirls, and has a thicker tooth. MR. NUTTALL, with his usual accuracy, and judgment, separated these closely allied species, which might, without careful comparison, be confounded.

3. P. (*Monoceros*) *lapilloides*. [Plate 20, fig. 18.] Shell short-fusiform, thick, whirls slightly concave above; spiral sulci obsolete; colour pale with spiral series of dark brown quadrangular spots; aperture and columella purple; margin of the labrum white.

*Inhabits* with the preceding.

Mr. NUTTALL has suggested the name *lapilloides* from the resemblance of the shell to P. *lapillus*.

P. *Nuttalli*. [Plate 20, fig. 19.] Shell ventricose, rather thin; body whirl with four spiral series of tubercles, the interstices of the series flattened; whirls with crowded minute spiral lines; margin of the labrum angulated, sulcated within; colour purplish brown; within pale salmon colour.

*Inhabits* coast of Fayal.

P. *Floridana*. [Plate 20, fig. 21.] Shell

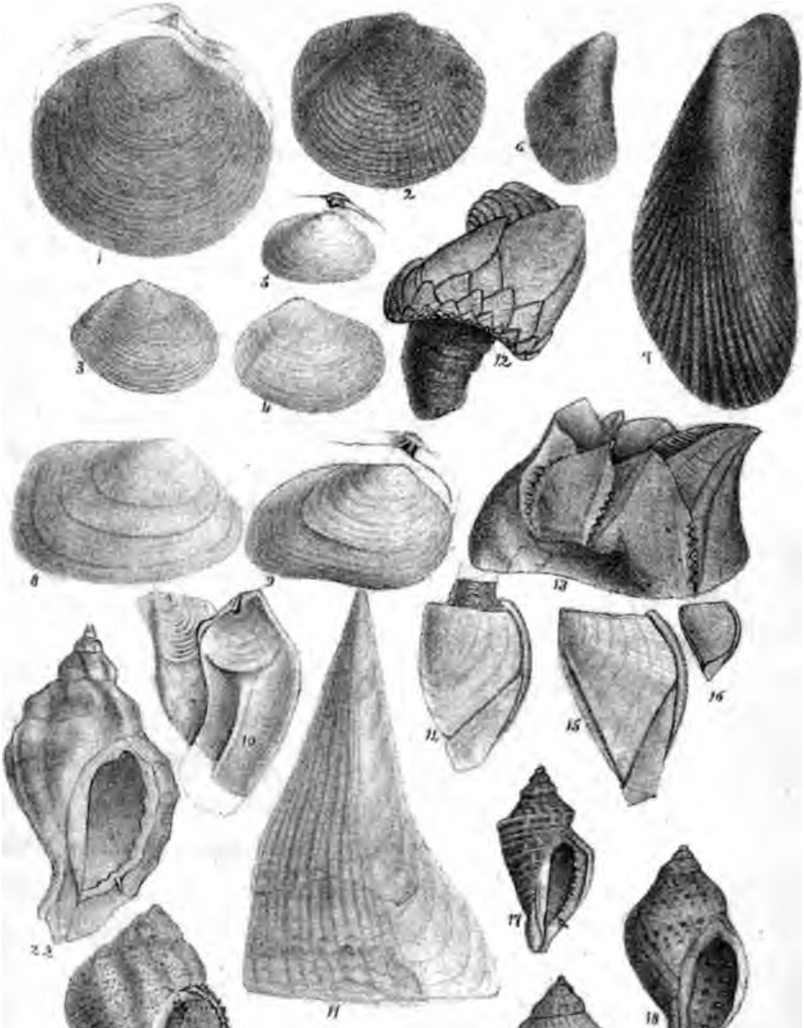
fusiform; whirls slightly concave above; spiral striæ prominent, unequal; whirls angular with a series of tubercles on the angle; whirls of the spire longitudinally plicated; the two terminal whirls smooth; labrum thin, sulcated within on the margin; colour white and brown variegated.

*Inhabits* the coast of Florida and Alabama. I found several specimens at Mobile Point, Alabama. It has series of narrow pale stripes, with brown spots.

P. *harpa.* [Plate 20, fig. 25.] Shell buccinifform; spire elevated; whirls convex, with broad flattened longitudinal ribs, and thick spiral striæ, profoundly elevated in the interstices of the longitudinal ribs; columella concave; margin of the labrum regularly arcuate; labrum sulcated within; colour dark brown; within blueish purple.

*Inhabits* coast of California; Sta. Barbara.

P. *bulbiformis.* [Plate 20, fig. 23.] Shell turbinate, ventricose, thick, umbilicated; longitudinally undulated; whirls with numerous spiral very squamose striæ; spire short, conical; aperture rather more than half the length of the shell; labrum sulcated within; margin foliated; colour white, tinged with pale purple; within pale purple or white.




T. A. Conrad del.

*Inhabits* the Sandwich Islands.

Allied to P. *abbreviata*, but is proportionally shorter and has a much smaller umbilicus.

P. *dumosa*. [Plate 20, fig. 20.] Shell narrow-fusiform with longitudinal angular ribs armed on the back with a series of foliated spines; spiral striæ unequal in size, alternated, squamose; spire elevated, pointed; aperture half the length of the shell; columella with three obsolete plicæ; aperture narrow, rounded or obtusely angulated above; labrum sulcated within, submargin denticulated; colour pale; within purple.

P. *macrostoma*. Shell patulous, body whirl with six remote spiral series of conical prominent obtuse tubercles, with an intermediate obtuse prominent line and finer striæ; spire very short, tuberculated; columella with two or three plicæ; callous at its junction with the labrum; labrum dentate within; margin foliated; colour pale; within whitish, with a few fulvous spots on the columella and submargin of the labrum.

*Inhabits* Coast of California; Sta. Barbara.

Closely related to P. *aperta*, but may be readily distinguished.

P. *foliacea*. [Plate 20, fig. 24.] Shell short-fusiform, ventricose, with longitudinal undulations and spiral costæ; whirls with crowded spiral foliated striæ; labrum costate within, margin foliated; columella with an obtuse or obsolete fold.

*Inhabits* the Island of Atooi.

## *Observations on the effects of a remarkable atmospheric current or Storm as witnessed on the day following its occurrence.* By WALTER R. JOHNSON, A. M., Mem. Acad. Nat. Sci. of Philadelphia, &c.

Read Febuary, 21, 1837.*

CONSIDERED as a meteorological phenomenon, the calamity which, on the 19th of June 1835, desolated a part of the city of New-Brunswick

* The substance of these observations was verbally communicated to the Academy, June 23d, 1835—together with a diagram explanatory of the positions of trees prostrated, materials strewed upon the ground, and the situation of buildings, removed towards the centre of the track of the storm. The writer then took occasion to suggest that an examination of the forest land, passed over by the tornado, should be made by the help of the compass, in order to verify the justness of the views which he had presented, respecting the direction of the trees in different parts throughout the breadth of the track. This task was subsequently performed during a visit to the scene of devastation, by Messrs. ESPY and BACHE, the result of which showed conclusively the correctness of the general statements contained in this paper. The remarks in this article were prepared immediately after the communication to the Academy, and submitted to a friend, in whose hands they remained till within a few days of the time when they were read; which accounts for the delay in their presentation to the Academy, and has given time for the publication of several other accounts, the materials for which were afterwards collected.

in New-Jersey, is worthy of the most attentive investigation. In connexion with the accompanying sudden, and singular changes of temperature, and moisture in the air, it may serve to illustrate the causes of those occurrences which, sometimes in our own climate—and more frequently in tropical regions—display effects which have hitherto perplexed the minds of the most acute observers. All accounts concur in representing the air of the morning, and indeed of the whole day up to the time of the tornado, as unusually sultry. This was observed between the hours of two and four P. M., in a ride from Hightstown to Princeton, a distance of about nine miles; also, in the city of New-York, and on the voyage from the latter city to New-Brunswick. At four o'clock the sun was still unobscured at Princeton; but within half an hour a cloud from the north-west had reached that place, and a shower of rain, accompanied by a brisk wind from the south-west, had commenced. Before five o'clock, the rain had ceased, and the air was less oppressive. The evening continued tranquil until ten o'clock, when another shower of rain fell, accompanied by some wind; but within half an hour, the sky was once more cloudless, and the wind began to rise with much force, from the west or north-west. Some observations on Polaris, Saturn, and other hea-

venly bodies, were made by Mr. ALEXANDER of that place, between eleven and twelve o'clock, but the state of the air did not appear favourable to the distinct, and steady perception of the minuter telescopic objects; owing, as was supposed, to irregular refraction, and the occasional sudden formation of mist in certain quarters of the heavens. A sensible depression of the dew-point was noticed at the time as indicated by the action of the air on the lungs, as well as on the surface of the body. From 12 at night to 5 the next morning the wind was boisterous; and a great change in the state of the atmosphere had obviously taken place. An electrical machine, which it had on the day previous been found impossible to excite, was, at nine or ten o'clock, A. M., able to yield sparks an inch and a half or two inches long, between balls three-fourths of an inch in diameter—a sure indication of an increased distance between the dew-point and the temperature.

Intelligence of the occurrences at New-Brunswick having been received during the forenoon, it was resolved to visit the spot, and endeavour to ascertain, by observation and inquiry, while the traces were yet unobliterated, such facts as might explain the mode of action by which the devastation had been effected. On arriving within six miles of New-Brunswick, on the old turnpike

road, we* were informed by an eye-witness, that it had been seen about a mile and a half north-easterly from that point; and that the dense black cloud was, by the junior observers, conceived to be *filled with crows*, — an appearance, afterwards explained by the fact that shingles, boards, &c., had been carried upward by the tempest from buildings destroyed in that vicinity.

On reaching the height of land, at about half a mile from the dense portion of the city, the first buildings which had been damaged by the tornado were passed. A barn had been completely demolished, and most of the lighter materials scattered to a great distance. The house was not thrown down, but left leaning with no part of the roof remaining, except some of the rafters; and the fact here witnessed was repeatedly observed in the town below, where several houses within the path of the tornado were deprived of their shingles, and the ribs which had held them to the rafters; but the latter still continued partially or entirely undisturbed. In a few cases, in which the ridge of a building lay in a northerly and southerly position, the eastern slope of roof was

* In this excursion, and the subsequent inquiries, the writer was accompanied, and aided by his friend Professor Joseph Henry; who is to be considered as entitled to a full share of whatever credit may attach to the observations referred to in this paper.

observed to be removed, or at least stripped of its shingles, while the western slope remained entire. Many buildings were likewise observed with holes in their roofs, whether shingled or tiled, but otherwise not much damaged, unless by the demolition of windows. These appearances clearly demonstrated the strong *upward* tendency of the forces by which they were produced, while the half unroofed houses, already mentioned, prove that the resultant of all the forces in action at the moment was not in a perpendicular to the horizon, but inclined to the east. Such a force would apply to the western slope of the roof some counteracting tendency, or relieve it from some portion of the upward pressure. Had there been no other facts to show the powerful rushing of currents upward, the above would, it is conceived, have been sufficient to settle the question, but taken in connexion with the circumstance that roofs so removed, were carried to a great height and their fragments distributed over a large extent along the subsequent path of the storm, that beds and other furniture were taken out of the upper stories of unroofed houses, that persons were lifted from their feet or dashed *upward* against walls; and that in one instance, a lad of eight or nine years old, was carried upward and onward with the wind, a distance of several hundred yards; and particularly that

he afterwards descended in safety, being prevented from a violent fall by the upward forces, within the range of which he still continued :—in connexion with these and similar facts, it seems impossible to doubt that the greatest violence of action was in an upward and easterly direction.

The next point to which attention was called by the appearances around, was the manner in which this upward current had been supplied from below; and for the solution of this question, it was necessary to compare objects throughout the whole breadth of the track left by the storm. A peach orchard on the slope of the hill descending to the town gave the first indication in regard to this matter, but the larger fruit and ornamental trees, in the gardens of Dr. JANEWAY, Messrs. KIRKPATRICK and others, in the same neighbourhood, together with an inspection of the forest on the east side of the river, showed conclusively that on the extreme borders of the track the forces were nearly, or quite at right angles to its general direction. Uprooted trees along the southern border lay with their tops towards the north; those on the northern border to the south, thus pointing to a common object in the central line of the current. From the outer edges however toward this central line the trees were observed on both sides to have a gradually increasing inclination to-

wards the east, and in the middle to be entirely in *that*, as a general direction. I do not recollect to have encountered a single case in which the top of a tree *with its roots in the ground* was lying towards the west, though I cannot say that none occurred, for among the houses and other obstacles within the city, presenting different degrees of resistance to the lateral currents, there may very probably be some points in which great violence was exerted in directions varying from the general course of action. None were seen with the tops from the centre of the path. Another fact to this point, is, that Dr. JANEWAY'S barn, a frame building, which was on the southrely part of the track, was unroofed, and the remaining part of the structure with its contents removed bodily three or four feet to the *northward*. All the herbage, shrubs and trees in its immediate vicinity, and the trees of KIRKPATRICK'S garden, were found lying with their heads in a northerly or northeasterly direction. Similar to the case of the barn just mentioned was that of BISHOP'S store, near the river; which, standing on the northern border, had been lifted from its foundation about four or five feet towards the south. A row of poplar trees which had been prostrated in the lower part of the city,

and on the *northern* part of the path was observed as a striking exemplification of the application of lateral force, every tree taking in its fall a southerly direction. Another evidence of lateral inward currents, was found in the appearance of many forest trees, east of the river, which though too far removed from the central line of the path to be uprooted, were still so much within the range of the lateral forces as to have their outside limbs, or those most remote from the central line, broken off by the effect of cross strain; while no similar fracture was seen on limbs turned towards the centre of the path. This result will be easily understood, when we consider the well known difference between breaking a limb by cross strain and that of drawing it asunder by simple longitudinal tension.

Another fact indicative of the direction of currents from the sides inward, was noticed on the plain east of the Raritan, where the fragments of boards, shingles, ribs, &c., which had been brought from houses demolished in the city, were seen to be arranged on the ground with some irregularity, certainly, but with far greater conformity of position than we could have anticipated. Their longitudinal direction was generally towards the central line, and also towards the point to

which the storm was moving. Many of these were found far beyond the belt of ground on which the violence of the wind had been exerted. Their position may be explained by referring to the three forces in action at the moment they reached the ground:—first, the force of gravity, which, if the air had been motionless, and the bodies descending perpendicularly, would probably—from the unequal density of the parts of the several masses—have caused most of them to descend endwise; and then the position, subsequently taken by them respectively, would have been a matter of indifference, and we might have expected to find them lying promiscuously. But, second, they were, while in the air, moving onward with the storm in an easterly direction and when the lower end struck the ground, the composition of this force with gravity, would naturally have thrown the centre of gravity over to the *east*, and we should have expected to find the lighter end of every piece of timber in that direction. But, third, if a current of wind were encountered near the ground, running towards the centre of the path, we should, on the north side of the path, expect to find the lighter ends of each piece directed to the southeast, and on the south side, to the northeast; precisely what appeared to be the case, so far as

could be judged from the general appearance of the masses.

The next set of facts observed, was that which relates to the course of the materials projected upwards after they had arrived at a considerable elevation. All accounts agree that the appearance of the cloud was that of a funnel or inverted cone with the apex resting on the ground. The falling rafters, scantlings, and other parts of the ruined buildings, generally indicated that they were, subsequently to the *upward* violent action, carried outward by the gradual enlargement of the current into which they had been drawn. The shingles and boards, just described, were cases in point being found far beyond the trail of the tornado as marked upon the surface. Rafters, which penetrated buildings south of the track, entered them on the north side and in a direction inclining to the southeast. Their descent in some instances was with great violence, contrary to what happened in the range of the upward motions; where a lad, already referred to, was deposited in safety after an aërial journey of one-fourth of a mile. A window frame and brick wall were, in one instance, penetrated by a rafter, twenty feet in length, eight inches wide, and from four to six inches thick. In the passage of the storm from the city

to the opposite bank of the Raritan, no indications are, of course, left to mark the peculiar action upon the waters; though we have heard it stated, but cannot say upon what authority, that the bed of the channel was laid bare, and from the nature of the forces and their violence, we cannot doubt that had it traversed a great extent of water surface, it would have assumed the character, as it certainly had the *form*, of a water spout. On encountering, however, the opposite bank, some peculiar effects were seen to have been produced. The upper edge of the bank especially, was marked by two well defined stripes, each from ten to twenty feet wide, and one hundred, or more, feet asunder. Here, it was supposed, must have been the outer edge of the aërial trunk, or funnel through which the air rushed upwards, and as the tornado, in its onward movement, advanced against the bank, the air coming in on every side to fill up the partial vacuum would exert the greatest force at the moment when it changed its horizontal for a vertical motion. The surface of the ground beyond this point seemed, in some places, to have been raised, as if the air beneath, by its sudden rarefaction, had thrown up small portions of the soil which was rather dry and porous; and it is, perhaps, worth consideration, whether this cause

may not, in this and similar occurrences, have facilitated the overturning of trees themselves.

It was a subject of regret at the moment, that want of time, and of a suitable instrument to measure the exact course of the tornado, and the precise position of trees in the different parts of the track, prevented carrying out a plan, which suggested itself on the spot, as the most satisfactory method of arriving at precision on those points.

In conclusion it may be remarked, that the directions and intensities of the forces in this occurrence, together with the hygrometric states of the air, preceding and following the meteor, and the inverted conical form of the moving column, as confirmed by several witnesses, not less than the fall of hail, and the distribution of fragments of materials beyond the path of the ground current —seem most satisfactorily accounted for, on the supposition that a disturbance of atmospheric equilibrium, results from a deposition of moisture in the higher regions of the atmosphere giving out a great amount of latent heat, which, in turn, expands the cold dry air above the forming cloud, and creates an ascending movement; the expansion of pure air by an addition of heat, being in such cases much greater than the contraction of the

atmospheric mixture by a condensation of its moisture.—In this effect is, of course, involved the well known principle that the capacity of air for heat is augmented as its volume expands, but the increase of capacity for heat being less rapid than the supply of heat from aqueous depositions, an ascending current is maintained with a force due to the difference of these two causes.*

* The origin of this view of the subject with which the writer had been made acquainted previously to the examination above detailed, is due to Mr. J. P. Espy.

## *Observations, on the different species of Hares (genus* LEPUS*) inhabiting the United States and Canada.* By J. BACHMAN, D. D., President of the Literary, and Philosophical Society, Charleston, S. C., &c.

Read, March 21st, 1837.

AMONG the various Genera of Quadrupeds of which descriptions have been given, there are few that have presented greater difficulties than the Hares. Although the species are notnu merous, containing not more than sixteen or eighteen that are well defined; and though they form one of the most natural groups in the mammalia, yet these are scattered so widely over the earth, the difficulty of procuring specimens for comparison is so great, and many of the species so nearly resemble each other in many particulars, that the student in natural history has sometimes been greatly perplexed in deciding on the exact species referred to by authors. Until very recently a

doubt has existed, even in Europe, whether their common Hare (LEPUS *timidus*) and the Alpine variable Hare (LEPUS *variabilis*) were not identical. By others it was doubted whether the LEPUS *variabilis*, and the Polar Hare of HEARNE, (LEPUS *glacialis*,) constituted two species. Since the return, however, of Captain PARRY, Dr. RICHARDSON, and the adventurous explorers of the Polar regions, naturalists have been enabled, by comparing specimens of the latter quadruped, which were procured on their journeys, with those of Europe, to ascertain that the species were distinct. In our own country, similar difficulties have existed. Some of our writers on natural history, and especially the lamented GODMAN, as late as 1826, doubted whether the LEPUS *glacialis*, L. *variabilis*, and L. *Virginianus* might not prove to be one species; and even as late as 1831, the translator of CUVIER (see vol. i. page 155, in a note; and page 442 in the catalogue) has united our LEPUS *Virginianus* with the LEPUS *variabilis* of PALLAS. Although these difficulties have been, in some measure, removed by the farther advancement of knowledge on subjects of natural history — yet as the habits of some of our species seem to be but imperfectly known, and as several new species have been recently added

to our fauna, increasing the number from two to seven, I have thought I might contribute something to the cause of science by preparing a monograph of this genus, and adding to it such information as I possess respecting the habits and localities of the different species. Although nearly all the species of this genus that are at present known to exist in our extensive country, are familiarly called Rabbits, yet it must be observed that they are all true Hares. Although most of them retreat to holes when pursued, they never burrow or conceal their young under the ground, like the common domesticated rabbit. Their nests are generally open—placed on the surface of the earth, almost destitute of a lining of fur, and their young are covered with hair, and are able to see at birth, and to leave their nests in a very few days.

The Hares have been arranged by naturalists under the

*Order* RODENTIA,

GENUS LEPUS, L.

Incisors $\frac{4}{2}$ Canines $\frac{0—0}{0—0}$ Molars $\frac{6—6}{5—5}$ 28.

Upper incisors in pairs, two in front, and two immediately behind them; the former large and cuneiform, with a longitudinal furrow down

the front, the latter small; the lower incisors square; cheek teeth,—flat crowns with transverse laminæ of enamel; ears and eyes large; five toes to the fore feet, and four to those behind, with nails slightly arched; interior of the mouth, and soles of the feet to the nails, covered with hair; tail short; mammæ from six to ten, caccum very large; (CUVIER).

1. LEPUS *glacialis*. (LEACH). Polar hare.

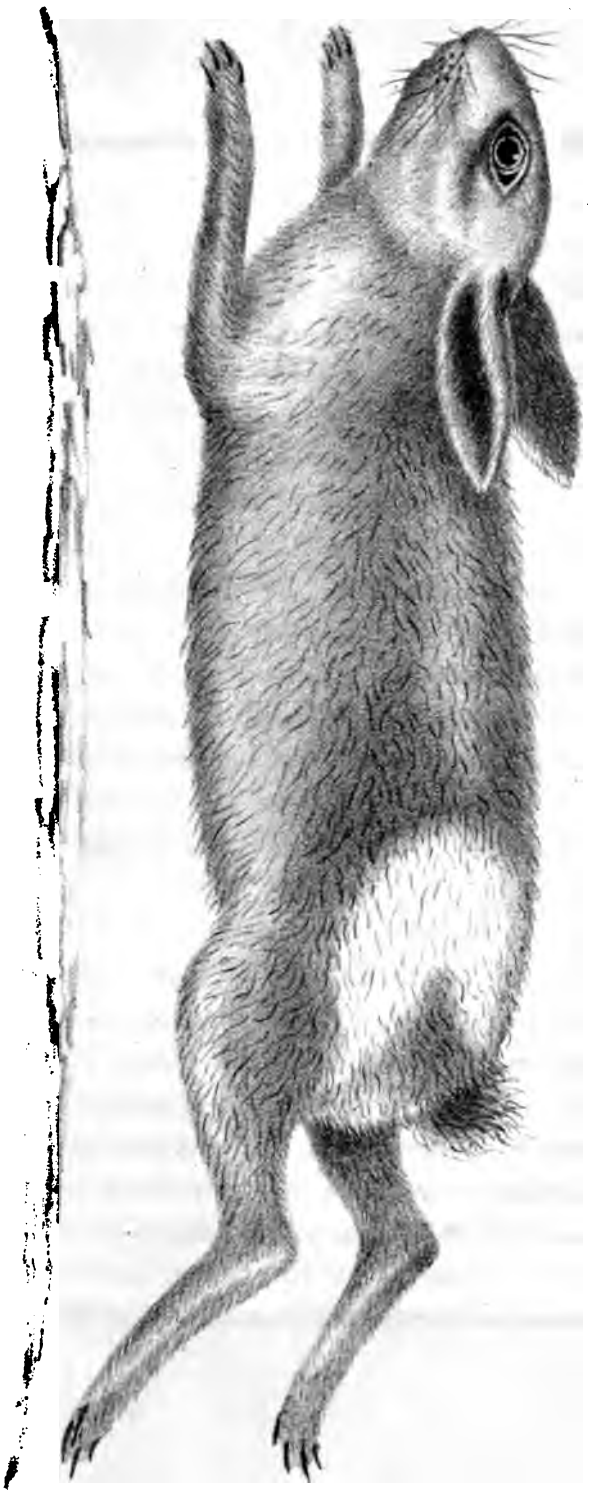
LEPUS *glacialis*. LEACH, Ross' voyage. Captain SABINE, Sup. PARRY'S first voyage p. 188. FRANKLIN'S Journal p. 662. RICHARDSON'S appendix. PARRY'S second voyage p. 321. HARLAN'S fauna p. 194. LEPUS *glacialis*, AUDUBON'S Ornithological Biography, second vol. page 470.

*Characters.* Size larger than the L. *Virginianus;* colour in winter, white; hair of a uniform white to the roots. In summer of a light gray above; ears black.

This fine, and interesting species, the largest at present known on the continent of North America, was not recognised as a species distinct from

the varying hare, until several specimens, carried to Europe from the Polar regions by Captain Ross and others, enabled naturalists to establish it as a distinct species. Several specimens, all, however, in their winter pelage, now exist in the different museums of Europe.

To the kindness and liberality of AUDUBON, the deservedly celebrated American Ornithologist, I am indebted for a specimen of this species in its summer dress, at the interesting period when it was just beginning to change to its winter pelage. Dr. RICHARDSON states that he had not been able to obtain a full grown summer specimen; and the one now in my possession, as far as I have been able to ascertain, is the only specimen, in summer colour, that exists in any collection. I have thus been enabled to ascertain many interesting particulars with regard to its colours in summer, and the process by which the mutations this quadruped is subject to are effected. In the descriptions of its winter dress, I derive my information from Dr. RICHARDSON'S Fauna-boreali-Americana, a work necessarily defective as regards the habits of many American quadrupeds; but which, in a scientific point of view, is highly creditable to its author, containing more accurate descriptions than are found in any other



LEPUS GLACIALIS

works on the American mammalia. The summer pelage I give from the specimen before me. In my account of the habits of an animal which has so seldom fallen under the observation of naturalists, I add to their short descriptions, such information as I have been able to glean from conversations with intelligent observers.

Dental formula — the same as in the other species of this genus.

Incisors yellowish white; upper ones considerably arched, and deeply grooved; the inner lobes a little longer and narrower than the outer. The two small supplemental upper incisors also grooved. The lower incisors smooth and even.

*Size.* Larger than the LEPUS *Virginianus* — equal, if not superior, to the largest English hare. Head about a third larger than that of the American hare — more arched than any other American species; whiskers composed of few, stiff, long hairs; body large, and finely formed; legs long, soles long, broad, thickly covered with hair — concealing the nails, which are long, moderately broad, and somewhat arched. Tail of a moderate length, woolly at the roots, intermixed with longer hairs.

*Colours.* The fur in winter, is, according to RICHARDSON, of a pure white, the hairs being uniformly so to the roots. That of the ears are brownish black to their base.

In its summer dress, this species is of a grayish brown colour on the whole of the head, extending to the ears. The ears are conspicuously black, bordered with white on their outer margins. The under surface of the neck and breast, dark blueish gray. The whole of the back, grayish brown; the fur, under the long hairs of the back, soft and woolly and of a grayish ash; the hair interspersed among the fur, dark blue near the roots, then black, and tipped with grayish fawn: a few black and white hairs interspersed throughout; the wool on the under surface is blueish white — interspersed with long hairs of a slate colour; the hairs, forming the whiskers, are white and black, the former colour predominating. The inner sides of the fore-legs, thighs, and under surface of the tail, pure white; the hair on the soles, yellowish brown; nails nearly black.

The large size of this animal, with its long black ears, give it a peculiar and striking appearance.

The specimen from which this description was taken, had just commenced changing to its winter

dress. The animal was obtained at Newfoundland, on the 15th of August, 1833; and was purchased from an Indian, immediately after it was killed. At that period, then, the change, from the summer to its winter pelage, had already commenced. There is a large spot, nearly a hand's breadth, of pure white on the back extending nearly to the insertion of the tail; three or four white spots, of about one inch in diameter, are also found on the sides. The hairs, forming these spots, are much shorter than the surrounding fur; which, as far as this species is concerned, satisfactorily solves the doubts which have existed as to the manner in which the change of colour is produced. In birds, as well as in quadrupeds, there are some species in which great changes of colour take place from the young to the adult state, and also at different seasons of the year; the question is often asked, whether this is effected by a gradual change of feathers, or pelage, or by a sudden moult in birds, and a shedding of the hair in animals. I am inclined to the belief from many experiments on animals and birds in captivity, that nature, in effecting these changes, does not proceed with uniformity in all the species. I have observed in the yellow crowned warbler (SYLVIA *coronata*) that the change occurs by a

sudden moulting in spring; and in a very few days it changes its homely dress, with which it came to us in Autumn, for its bright nuptial livery of Spring and Summer. The SYLVIA *petechia* is, during autumn and winter, so nearly of the colour of the S. *coronata*, that they cannot, without careful examination, be known from each other. In spring, this bird becomes olive green on the back, beneath yellow; the head, at the same time, becomes of a bright chesnut bay colour; in this state of plumage, BONAPARTE (vol. 2., p. 12.) has described it as a different species, (S. *palmarum*). In this bird, also, the change is effected, as I have observed on an examination of more than fifty specimens, by a moulting of the feathers from the 1st to the 15th of March, in Carolina; and it, in the course of two weeks, receives its bright summer plumage. On the other hand, there are many birds in which these changes take place slowly, and by a somewhat different process — the gradual fading or brightening of the feathers immediately after a moult. Thus I have seen the young of the whooping crane, in confinement, in the ash coloured plumage, under which it was described as the Canada crane (GRUS *Canadensis*,) undergoing its mutations. A pair of these birds when nearly two years of age, as they increased in size,

began gradually to change their colours, I was in the habit of visiting them every two or three days during four or five months. They had just moulted — many of their new feathers were still sheathed. I could, at every renewed visit, perceive that the plumage was continually becoming lighter till at last they were nearly pure white; and I was gratified to find my previous conjectures correct, that the birds I had so anxiously watched, were whooping cranes (GRUS *Americanus*). A male of the summer duck, (ANAS *sponsa*,) which I have preserved in an aviary for some years, loses its brilliant plumage at the time of moulting in summer, and continues for several weeks afterwards in the plain livery of the female, when the feathers begin to brighten gradually; from day to day the change continues, until, after the expiration of a few weeks, the bird assumes all its bright and beautiful plumage.

All our birds that assume one set of colours during six months of the year, and different ones during the other six months, appear to moult in spring, as well as in summer. My examinations have extended to the SYLVIA *coronata*, FRINGILLA *Savanna*, FRINGILLA *Pennsylvanica*, SYLVIA *petechia*, CHARADRIUS *helveticus*, STREPSILAS *interpres*, and several species of STERNA, LARUS,

&c. The same harmony of nature seems to prevail with regard to those quadrupeds that are subject to these semi-annual changes. Thus I conceive that the Ermine, the Polar and the Northern hare are subject to a shedding of the hair in autumn, as well as in spring. But, as in birds it appears that those feathers only, which assume a different colour, drop out, so in some of our American hares, in which very great changes from summer to winter dress do not occur, as in the American Hare, the Marsh Hare, &c. — that portion of the pelage only may be replaced, which, in winter, presents a colour differing from that of summer. All our hares, that are subject to these semi-annual mutations, lose their winter colours by shedding their hair, and all assume the shorter hair and livery of summer; but when they reassume their winter dress, the process in different species seems to differ in some particulars. The change in the American Hare (LEPUS *Americanus*) is effected, first, by shedding the hair in autumn, and then by a gradual prolongation and whitening of the points of most of the hairs that are visible on the surface. An individual of the Marsh hare (LEPUS *palustris*) which I have now in confinement, has, within a few weeks past, shed at least a portion of its fur, and is now undergoing the change from its summer

to its winter dress, and the points of the hairs instead of becoming white — as in the American hare — are daily becoming longer and blacker. I have mislaid the notes taken twenty-five years ago, whilst engaged during a season in watching the changes which took place under my daily inspection, in several animals of the LEPUS *Virginianus* kept in confinement for that purpose. But I can state with a tolerable degree of certainty that the following was the process:— They became brown in spring, in consequence of their winter fur dropping off; and the change was effected in the course of a couple of weeks. The new coat, so much in unison with the appearance of the brown leaves that covered the earth, after the snows of winter had disappeared, was at first short and rather thin. The hair increased considerably in length during the summer. In autumn the hair was again shed; and, as the summer coat fell off, the hairs — composing the winter pelage — became visible through the rest. In three weeks the summer dress had entirely disappeared. The new hair was not however pure white, but of a light iron gray colour, mixed with occasional white hairs. Gradually the hair grew longer, and became daily whiter; till, in the course of a few more weeks, the change was complete. In the

species now under consideration (LEPUS *glacialis*,) the hairs which compose the summer pelage drop out, and are at once replaced by the snowy white pelage of winter. This is distinctly observable in the specimen now before me; the short white hairs are in different parts of the body seen pushing forward, whilst the surrounding ones seem to become thin and to drop out. In two or three weeks, to all appearance, the total change would have taken place. All my experiments on this subject have convinced me that, where the mutations of colours are not the immediate effects of a moult, or a shedding of the hair, they commence shortly afterwards; that no material change in the colours of the hair, or feathers, takes place after they have grown to full maturity, and that in all cases it is effected, as far as it is intended to advance that season, in less than two months.

How far the climate influences these changes, is a mystery which yet remains to be solved. That the change from dark colours to white usually occurs in cold climates, is evident; and yet it is no less true that it usually commences in the warmest seasons of the year. An Ermine, brought from the North to Carolina, assumed its lustrous white colours in October, when the weather was yet excessively warm. The Emperor of China

is said to have preserved the LEPUS *variabilis* in the warmest parts of his country, where they regularly became white in autumn. I have seen the LEPUS *Virginianus*, which I had domesticated, putting on the livery of winter in the warmest days of autumn, in anticipation, as it were, of the cold and dreary season that was approaching.

There must, therefore, be a constitutional predisposition in the animal to the change. Leaving these difficulties to be solved by future naturalists and philosophers, I shall proceed to give the

### *Dimensions of the* LEPUS GLACIALIS.

The measurements of this quadruped, as given by Dr. RICHARDSON in his Fauna-boreali-Americana, were evidently taken from a dried skin; and, probably, from a young animal. The length of his specimen is certainly much less than that of any of which I have heard. He gives 22 inches; this would make it a smaller species than even the LEPUS *Virginianus*. Specimens of both are now lying before me, and the latter appears about one-fourth less.

I will give the measurements of the skin from which I am now describing; and Mr. AUDUBON is under an impression that the animal in the

flesh, measured several inches longer than the specimen in its present state.

| | |
|---|---|
| Length of the head and body, | 26 in. |
| From the point of the nose to the ear, | 4½ |
| Of the ears measured posteriorly, | 4¾ |
| Tail (vertebræ), | 1¾ |
| Tail, including the fur, | 3½ |
| Whiskers, | 3 |
| Length from the wrist joint to the point of the middle claw, | 3¾ |
| From heel to end of the middle claw, | 6¼ |
| Weight, | from 7 to 11 lbs. |

*Geographical Distribution.*

This animal occupies a wide range in the northern portions of our continent. It is found on both sides of Baffin's bay; and, according to RICHARDSON, is common on the barren grounds as far north as the country has, as yet, been explored. He represents it as being only found as far south as the line of the M'Kenzie and Slave lake in latitude 64°; although he supposes it may possibly be found south of this line in Labrador, and the Rocky Mountains. In the North Georgian Islands, it has been seen in latitude 75°. He

farther states that it does not frequent wooded districts, but confines itself to small and thin clumps of spruce fir scattered on the confines of the barren grounds. The Polar hare certainly exists much farther south than the limits assigned to it above. The specimen now in my possession, was obtained at St. George's bay in Newfoundland in latitude 47½°, proving its existence certainly farther south, by 16½°, than was given as its southern limits by that author. It was represented as not only abundant in Newfoundland, but as found inhabiting the forests of that country. Indeed there can be but little doubt of the existence of the Polar hare considerably to the south of Newfoundland. I recollect many years since having had frequent conversations with a respectable farmer, of New York, whose parents, being loyalists, had removed with him when he was yet a lad, to Nova Scotia, where he had resided many years previous to his return to his native state. He was fond of hunting, and occasionally brought to me the L. *Virginianus*, and frequently spoke of it as far inferior in size, and flavour, to the great hare he had been in the habit of hunting in Nova Scotia. From his descriptions, compared with the information which has since been given to the world, of the Polar hare, I have

no doubt of its having existed in considerable numbers in some parts of that country, 40 years ago; and, in all probability, continues to do so still. It will not therefore be surprising, if it occasionally — in cold winters — visits the northern parts of Maine, if it does not permanently reside there. I have, indeed, heard from two sources that this was the case; and Mr. AUDUBON is under an impression that he was informed by T. LINCOLN, Esq., an intelligent and close observer, that the Polar hare was found in the northern portions of that state. St. George's bay, where AUDUBON's specimen was obtained, being in latitude 47½°, is farther south than the northern portions of Maine.

*Habits.* Of the habits of this hare, not much information has yet been communicated to the world. It is said, that "it seeks the sides of hills, where the wind prevents the snow from lodging deeply, and where, even in the winter, it can procure the berries of the Alpine arbutus, the bark of some dwarf willows, or the evergreen leaves of the Labrador tea-plant (*Ledum.*)" "Captain LYON states in his private journal, that on the barren coast of Winter Island, the hares went on the ice to the ships to feed on the tea-

leaves, thrown overboard by the sailors." It is farther asserted by RICHARDSON, that "it does not dig burrows, but shelters itself among large stones or in the crevices of rocks; and that, in the winter time, its form is generally found in a wreath of snow, at the base of a cliff, and that it weighs from 7 to 14 pounds."

The hare obtained by AUDUBON weighed seven and a half pounds avoirdupois, and was not in good condition. It was at a season of the year when both man and beast are, in that country, incessantly harrassed by the Moose fly; and the deer and hares suffer particularly in consequence of their attacks. The Indians, although tempted by a high reward, refused to go in search of this hare from a dread of this persecuting fly; and AUDUBON'S party, who had gone on a Moose hunt, was, from the same cause, obliged to return on the day of starting. All hares are in best condition about the commencement of the winter season. They differ considerably in weight even in the same species, owing to age, season and other causes. The average weight of the Polar hare in autumn, I conceive will be found to be nine or ten pounds. Some will go beyond, whilst others will fall short of this weight.

Dr. RICHARDSON also states, on the authority

of Indian hunters, that it brings forth but once in the year, and from two to four young at a time. On the other hand, the farmer who gave me the information of this hare as existing in Nova Scotia, asserted that he had on several occasions found their young—that he had never found less than five young in the nest, and had oftener seen seven, and considered the average number as about six. From the prolific nature of this genus, I am induced to confide in this statement. He remarked that when hunted by dogs, they made wider circles than the LEPUS *Virginianus;* and would, when hard pressed, retreat beneath heaps of drift wood, or the ledges of ice.

All travellers concur in stating the flesh of this animal to be white, and of a finer flavour than any of our hares. Dr. RICHARDSON says that it is superior to the American and Alpine hare of Scotland. The flesh of the individual procured by AUDUBON, was eaten by himself and party, and was pronounced delicious food. He conversed with a lady residing at the Harbour of St. George's bay, who informed him that she had for several years domesticated the Polar hares, and reared them as food—that they were not only fine flavoured, but were easily domesticated, and that she had only been induced to discontinue

rearing them in consequence of their having become troublesome to her garden.

From the intercourse which exists between Boston and the harbours of Newfoundland, it would not be difficult to introduce this rare and valuable species into the more cultivated portions of the United States. They might be kept in enclosures and would, no doubt, propagate and succeed well in the northern states; and, even should they not be particularly sought after by the epicure, their domestication would enable naturalists to become acquainted with their habits.

### 2. LEPUS *Virginianus*. (HARLAN.) The Northern Hare.

Varying Hare. WARDEN'S description of the United States, vol. 5. page 632.

Varying Hare. LEWIS and CLARK'S Journey, vol. 2. page 176.

Varying Hare. GODMAN'S Nat. History, vol. 2. page 163.

LEPUS *Virginianus*. RICHARDSON'S Fauna, page 224.

LEPUS *Virginianus*. Naturalist's Miscellany.

DOUGHTY. Figure in Autumn pelage, vol. 1., plate 19, page 217.

AUDUBON'S Ornith. Biog. p. 169, vol. 2., plate 181; represented in its Winter dress, in the talons of the Golden Eagle (FALCO *chrysaetos*).

*Characters.* Northern hare. Size, larger than the American hare, less than the Polar hare; colours, white in winter, roots of the hairs, blue, then yellowish fawn, tipped with white; summer dress reddish brown above, white beneath; ears a little shorter than the head.

This species was, until very lately, considered identical with the LEPUS *variabilis* of the Eastern continent. It proves, however, to be not only a smaller animal, but differing in many other characteristics, which, in this stage of the science, it is unnecessary to particularize. Whilst, however, the species is fully established, very contradictory accounts are given by authors of its habits and geographical distribution. Having possessed many opportunities of studying the habits of this animal in the northern parts of the State of New York, where I found recreation and amusement in pursuing and capturing it in various ways,

during school and college vacations; and having kept it in confinement for several years, where it bred, I propose giving such a description of its character and habits, as these opportunities for investigation have afforded me.

*Description.* Incisors pure white, shorter and smaller than those of the L. *glacialis;* upper ones moderately grooved, the two posterior upper incisors very small.

The margins of the orbits project considerably, leaving a distinct depression in the frontal bone; this is more conspicuous in the old than in younger animals.

The head is rather short; nose blunt; eyes large and prominent; ears placed far back and near each other; whiskers long and numerous; body elongated, thickly clothed with long loose hair, with a soft downy fur beneath. Legs long; feet thickly clothed with hair—completely concealing the nails, which are long, thin, very sharp, and slightly arched; tail very short, covered with fur, but not very bushy. The form of this species, is, on the whole, not very elegant, its long hind-legs, however well adapted for rapid locomotion, and its diminutive tail, would lead the spectator, at first sight, to pronounce it an awkward animal.

Its fur, both in winter and summer, never lies smooth and compact as in many other species, but seems to hang loosely on its back and sides, giving it a somewhat shaggy appearance.

*Colours.* The whole of the upper surface is of a light reddish brown; these hairs are blueish at base, then reddish brown, and nearly black at the tips; on the sides, this colour gradually becomes lighter. The throat, breast, inner parts of the legs and thighs, and under surface of the tail, are nearly pure white. This is the summer dress of the animal, which it assumes in April, and in which it continues till about the beginning of November in the latitude of Quebec, and the middle of the same month in New York and the western parts of Pennsylvania, when it assumes its winter pelage. In this state it is nearly pure white in high northern latitudes, although in the latitude of Albany, New York, it has always a slight tinge of reddish brown on particular parts of the body, giving it a wavy appearance, especially when the animal is running, or when the fur is in the least agitated. In this state the hair is plumbeous at base, then reddish and tipped with pure white; on the under surface, the hair, in most specimens, is white even to the base. The whiskers are com-

posed of numerous long hairs which extend to the base of the ears and are nearly all black; a few long black hairs arise from above and beneath the eyes and extend backwards. The pupil of the eye is dark, the iris light silvery yellow. The orbits of the eyes, in most of the specimens I have examined, were of a fawn colour; the ears tipped with dark brown, and edged with white. The parts of the body which are the last to assume the white change are on the forehead, the upper surface of the ears near their extremities, and on the fore-shoulders and sides. In their tracks on the snow,—so thickly are the soles covered with hair,—the prints of the nails are not very visible unless the animal is chased and running very fast. The soles have a yellowish, soiled, appearance. The young become white in the autumn of the first year, but assume this colour a little later in the season.

*Dimensions.* This species differs considerably in different individuals not only in size, but in weight. The measurements being usually taken from stuffed skins afford no very accurate indication of the size. Dr. GODMAN on the authority of BONAPARTE gives the measurement of a recent

specimen as 31 inches; and Dr. HARLAN's measurement of the skin, probably of the same specimen, is 16 inches. I have taken the dimensions of more than 50 specimens in the flesh, and have never found a full grown animal measuring from the point of the nose to the insertion of the tail, more than 25 inches nor less than 17. I will here give the dimensions of an old male which I considered of a moderately large size, and which were taken from the animal recently killed:

| | |
|---|---|
| Length from nose to the root of the tail, | 21 in. |
| ——— of the head, | 3½ |
| ——— of the ears, | 3½ |
| Height, from the shoulder to the end of the middle claw, | 9½ |
| Length of the fore-arm, | 4 |
| ——— of the fore paw, | 2½ |
| ——— of the thigh, | 5½ |
| ——— of the hind-foot, | 5½ |
| ——— of the tail, (vertebræ), | 1¼ |
| ——— tail, including the fur, | 2 |

In weight I have found this species in the beginning of winter, varying from five to seven and a half pounds, but consider six pounds to be the average weight of a full grown animal in good condition.

*Geographical Distribution.*—The LEPUS *Virginianus*, as its name would appear to indicate, has usually been considered as a southern species. This is an error. It is unquestionably a northern animal; confining itself to northern latitudes, and is not found in our southern states. I recollect having been informed by Mr. DOUGHTY, that he once killed an animal of this species on one of the highest mountains in the northern parts of Virginia; but it was there so seldom seen, that when he exhibited it to the residents of the neighbourhood they were greatly surprised; it being the first of the species they had ever heard of in that state. It may be observed, that the summits of the Allegany mountains present a cold dreary region, not unsuited to the habits of northern animals. In a botanical excursion, made two years since among those Alpine hills, I discovered no traces of this hare; but found there many quadrupeds, birds, plants, and insects, that usually are found in summer in a latitude several degrees farther to the north. PENNANT'S martin (MUSTELA *Canadensis, Lin.*) had there found a region adapted to its northern habits. The Rose-breasted grosbeak (FRINGILLA *Ludoviciana,*) the Olive-sided fly-catcher (MUS-

CICAPA *Cooperii*,) the Bewick's wren of AUDUBON (TROGLODYTES *Bewickii*,) and the Lesser snow bird (FRINGILLA *hyemalis*,) were there engaged in the cares, duties, and pleasures, of reproduction. It is not surprising, that in a region so elevated and cold, the hare now under consideration, may be occasionally found; although it seems to appear there as only a straggler. In the lower parts of Pennsylvania and even of New York it is scarcely known; it is rather rare on the Catskill mountains and is only occasionally brought to the Philadelphia market from the western counties of Pennsylvania. On the other hand, the farther north we proceed, the more abundant does this species become. It is occasionally brought to the New York market, from the neighbourhood of Albany. In the markets of Boston, Montreal, Albany, and Utica, I have seen it in great abundance; I also observed it in Maine, in Lower Canada, and in the neighbourhood of Niagara on the Canada side. DR. RICHARDSON states that it is found as far north as lat. 64° 30'. It was seen on the shores of the Oregon, at the Pacific, and eastward of the Rocky mountains on the plains of the Missouri, by LEWIS and CLARKE, and at Carleton house by DRUMMOND. Although it is not found

as far north as the Polar hare, yet it is fully entitled to the name of the *Northern Hare.*

The assertion of WARDEN and other authors, that the LEPUS *Virginianus* retreats into hollow trees, when pursued, is equally incorrect. WARDEN undoubtedly blended the habits of the American hare, with those of the LEPUS *Virginianus.* This, on the contrary, is the only species of the genus, in our country, that does not possess this habit. I have seen it chased by hounds for whole days, without its making an attempt to seek for concealment or a shelter. It evidently possesses more activity and fleetness than any other species at present known. LEWIS and CLARKE ascertained by measurement that it could leap 21 feet at a bound; and I have had satisfactory evidences that there was no inaccuracy in their statement. When hunted, it winds and doubles among thick clusters of young pines and scrub oaks, or leads the dogs through the entangled paths of hemlock and spruce until it fairly wearies out its pursuers; and, unless the hunter should appear, to stop its career with the gun, it is certain to escape. Even in deep snows, the animal is so light, and is so well supported by its broad furry feet, that it skims over the surface without making a deep impression, whilst the wearied hounds

plunge deep into the snow at every bound, and soon give up the hopeless pursuit. Dr. RICHARDSON asserts, on the authority of others, that this animal "is occasionally met with among the small clumps of poplars and willows, with which the plains are studded near their confines; but that it does not resort to the thick woods like the American hare." It may possess this habit in the solitary desert regions of the north, but throughout the whole of the northern portions of the United States, where it permanently resides, its habits in this respect are directly of an opposite character; avoiding not only open grounds but even open woods, and confining itself to the densest and almost impenetrable forests. Although it wanders by night in many directions in search of appropriate food, I have scarcely ever seen its tracks in the open fields. It seems to avoid not only the cabbage and turnip fields of the farmer, but seldom, even in the most retired places, makes an encroachment on his cultivated grounds. It is true this quadruped was observed by LEWIS and CLARKE on the plains of the Missouri, but it will be recollected that many portions of those prairies are covered with a rank growth of tall weeds and grasses, sufficiently high to conceal a

deer, if not a buffalo, and in such situations this hare can easily find a shelter and protection.

The food of the northern hare, in summer, consists of various kinds of juicy and tender grasses, and the bark, leaves, and buds, of several small shrubs; and they seem, in particular, to be fond of the young twigs of the wild alspice, (LAURUS *benzoin.*) But in winter when the earth is covered with snow, they gain a precarious subsistence from the buds and bark of such trees as are suited to their taste. Sometimes they scratch up the snow to feed on the leaves and berries of the various species of Pyrola, found in the northern states. The bark of the willow, birch, poplar, and the buds of young pines, are sought after with avidity. I have seen persons, in the northern part of New York—who were desirous of shooting these animals by moonlight—watching near the trees of the American black poplar (POPULUS *Hudsonica. Mich.,*) which they had cut down for the purpose of attracting this hare to feed on their buds and tender twigs. Those which I had in a domesticated state, were fed on cabbage leaves, turnips, parsnips, Irish potatoes, and sweet apples. In a cold winter, when these vegetables could not be conveniently obtained, they were frequently supplied with hay made from clover,

to which, when more appropriate food could not be obtained, they did not evidence any aversion. At long intervals, the outer branches of the willow, poplar, and apple trees, were thrown into their inclosure, the bark of which seemed to be greatly relished.

The northern hare, like most of this genus, seeks its food only by night, or in the early part of the evening. To this habit, it is more exclusively confined during autumn and winter, than in spring and summer. In the latter seasons, especially in spring, they are frequently observed in the morning, and as the sun is declining in the afternoon, along the solitary by-paths of the forest; sometimes two or three are associated, appearing full of activity and sport. When disturbed on these occasions, they give a stamp on the ground, so loud, that it can be heard at some distance, then hopping off some yards into the thicket, they sit with ears erect, seemingly listening to ascertain whether they are to be pursued. This habit of thumping on the earth, is common to most of the species; I have particularly noticed it in the domesticated rabbit, and in our common American hare. It more particularly takes place on moonlight nights, is indicative either of fear or anger, and is frequently observed among the males when they

meet in combat. During the period of cold weather, this hare retires to its lair at early dawn, and shelters itself under the thick foliage of fallen tree tops, particularly under those of the pine and hemlock. It occasionally retires to the same shelter for a succession of nights; but this habit is by no means common; and the sportsman that calculates on some succeeding day to find this animal in the place from which it was once started, is likely to be disappointed. I am not aware, that any of our species of hare are so attached to particular and beaten paths through the woods, as the one now under consideration. It nightly pursues these paths, not only during the deep snows of winter and for a succession of years, but even during summer. I have seen a dozen caught at one spot, in a snare composed of horse hair, or brass wires, in the course of the winter; and when the snows had disappeared, and the spring was advanced, they were still captured in the same way, and in the same paths.

The period of gestation in the female of this species is believed to be (although I cannot speak with positive certainty) about six weeks. Two females which I domesticated, and kept in a warren, produced young, one on the tenth, and the other on the fifteenth, of May; one had four,

and the other six, leverets, which were deposited on a nest of straw, under a coop placed there for the purpose. They succeeded in rearing all their young but one, which was killed by the male of a common European rabbit. They were not again gravid during that season. Ill health, and more important studies, required me to be absent for six months; and when I returned, all my pets had escaped to the woods, before I could satisfactorily finish the experiments which had interested and amused me in many a leisure hour. I, however, think it probable, that the females in their wild state may produce young twice during the season. The females referred to above, were much harassed by other species which were confined in the same warren, and might therefore have been less prolific than if they had enjoyed undisturbed their native woods. I have frequently observed the young of the northern hare in May, and again in July. These must have been either a second brood, or the latter the product of a young female of the previous year. The young, at birth, were able to see, and were covered with short hair; were somewhat lighter than the old at that season, but resembled them in colour. They left their nests in five or six days, and from that time seemed to provide for themselves, and to derive little sustenance or pro-

tection from their mothers. The old males at this period seem to be animated with renewed courage. They had previously suffered themselves to be chased and harassed by the common English rabbit, and even retreated from the attacks of the American hare; but they now stood their ground, engaged in fierce combats with the other prisoners confined with them, and generally came off victorious. They stamped with their feet; used their teeth and claws to a fearful purpose, and in the fight, tore off patches of skin and mutilated the ears of their pursuers, till they were left in the undisturbed possession of the premises. The males did not evince the vicious propensity in destroying their young, which is observed in the domesticated English rabbit; on the contrary, they were frequently sitting beside their little family, when they were but a day or two old, seeming to enjoy their playfulness, and to watch their progress to maturity.

The Northern hare seems to prefer dry and elevated situations, and to be more fond of grounds covered with pines and firs, than of woods clothed with oak or hickory. The swamps and marshes soil their feet, and after having been compelled to pass through them, they are for hours employed in rubbing and drying their paws. In winter,

however, when these situations are hardened by the frost, they not only have paths through them in every direction, but occasionlly seek a fallen tree top as a hiding or resting place, in the centre of a swamp.

As an article of food, the Northern hare is the most indifferent of all our species. The flesh is hard, dry, almost juiceless, possessing none of the flavour of the English hare, and is much inferior to that of our American hare. Epicures, however, who often regard as dainties, articles that are scarce, and who, by means of the culinary art, possess modes of rendering things savoury, that are insipid, may dispute this point with me.

The Northern hare, as is proverbially the case with all the species, possesses many enemies. It is pursued by men and dogs, by carnivorous beasts of the forest, by eagles, hawks, and owls. In the northern parts of Maine, in Canada, and farther north, their most formidable enemies are the Northern lynx (FELIS *Canadensis*,) the Jer falcon (FALCO *Islandicus*,) and the Snowy owl (STRIX *nyctea*.) In the New England states, however, and in that of New York, the Red-tailed hawk (FALCO *borealis*,) is, during spring, occasionally seen with one of these species in his talons. But its most formidable enemy, is the Great horned

owl (STRIX *Virginiana.*) I have also, on one occasion, observed a common house cat dragging a full grown Northern hare from the woods, to feed its young brood. Lads, on their way to school, entrap them with snares attached to a bent twig, placed along the paths of their nightly resort. The hunter finds recreation in pursuing them with hounds, whilst he places himself in some wood-path where they were last seen to pass.—The hare keeps from fifty to a hundred yards ahead of the dogs, and in its windings and turnings to avoid its enemies, soon returns to the spot where the hunter is stationed, and falls an easy prey. Thus, one by one, these harmless animals are slaughtered—not for food, or for the skin, for these are of but little value—but for the mere enjoyment of the sport.

I will here relate a circumstance, with regard to the chasing of the hare, that I have witnessed on three or four occasions, which, if it does not afford food for the speculations of the physiologist, may serve to convey a reproach to the sportsman for his acts of inhumanity. I have seen the Northern hare, after it had been severely chased for several hours in the afternoon, retiring to a thicket, after the hounds had been called off; and when, on the following morning, I examined the place of its retreat I dis-

covered, to my surprise, the animal sitting in its form under a bent pine bush covered with snow—quite dead! It had been greatly overheated by the long chase, rendering it, in a state of rest, more susceptible of cold;—it was probably suddenly chilled, and life became extinct. I have also, on two occasions, found this species dead in the woods, after the melting of the snow in spring, and in endeavouring to investigate the cause of their death, I ascertained that portions of wire snares were closely entwined around their necks, from which they had not been able to extricate themselves.

I have ascertained that this hare, when captured, cannot, like the American hare, be taken into the hand with impunity. The latter, when seized by the ears or hind-legs, soon becomes quiet, and is harmless; but the former struggles to escape, and makes a formidable opposition with its teeth and nails. A servant, who was fond of capturing the American hare in box-traps, and knowing my curiosity to examine any object in natural history, once came to me with a rueful countenance, holding a hare in his hand, exhibiting, at the same time, his scratched hands, torn clothes, and his leg, which was bitten, declaring that he had caught, to use his own words, "a rabbit as cross as a

cat." I ascertained it to be a Northern hare in its summer dress, and although he had not been able to distinguish the species by the colour of the animal, he had acquired a feeling lesson in natural history which he did not soon forget.

The skin of the Northern hare is so tender, and so easily torn, and the fur so subject to become disordered and drop off on being handled roughly, that it is difficult to prepare perfect specimens for the cabinet. It is not in much use among the furriers, and even among hatters is regarded as of trifling value. The hind feet are however in request by the latter to smooth down the felt of their hats, and answer the purpose of a soft hat brush.

### 3. LEPUS *aquaticus*. The Swamp Hare. [Plate 22, No. 2.]

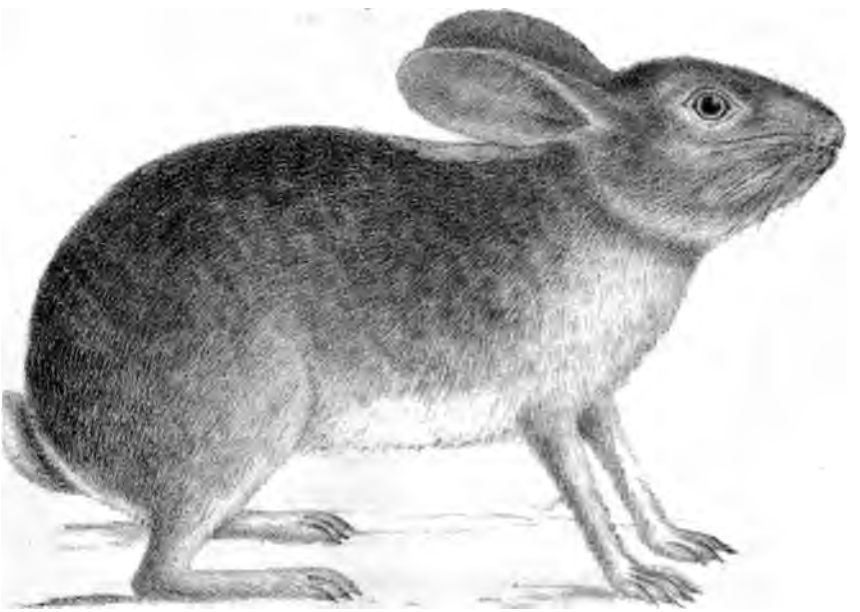
*Characters.* Larger than the American hare; nearly the size of the Northern hare; tail, ears and head long; feet long, narrow, less covered with hair than those of the American hare; general colour, nearly black above, white beneath.

During the last fifteen years, I have received frequent accounts of a hare existing in the

swamps of Alabama and Mississippi, larger than the common American hare, swift of foot, of habits in many respects aquatic, and nearly black in winter. Through the kind attention of Dr. J. M. LEE, and of Captain BENJAMIN LOGAN, of Alabama, I have been able to receive specimens of this quadruped, and to prepare a description of it. I have also received letters from Major P. S. H. LEE, from Mr. PEAKE, resident of Dallas county, Alabama, and from J. J. AUDUBON, Esq., who have possessed many opportunities of studying its habits in Alabama and Louisiana, which enable me to give the history of a species which is now for the first time brought to the notice of the naturalist.

*Colour.* Teeth yellowish white; the whole of the upper parts of the body light brownish yellow, blotched on the surface with black. In the winter the whole of the back, with the sides of the head, becomes nearly coal black, with here and there a mixture of reddish brown, visible on the surface; the fur beneath the long hairs is dark plumbeous, tipped with black. The long hairs, when examined singly, are dark blue at the roots, then light buff and painted with black. Behind the ears, rufous, with a stripe of a similar colour

LEPUS NUTTALLII .



*LEPUS AQUATICUS* .

extending to the shoulders. A line around the eyes, light reddish buff. The upper lip, the chin and belly, white tinged with blue. Nails in a winter specimen of a young male, dark brown; in another, procured in summer, of an old female, they were yellowish. Whiskers black. Inner surface of the ears light greyish white, outer surface above, edged with black. Under surface of the tail pure white.

*Dimensions.* The following measurement was taken by Dr. LEE, of Alabama, of a specimen in the flesh.

| | |
|---|---|
| Length, from the point of the nose to the insertion of the tail, | 20 in. |
| Length, of the head, | 4½ |
| ——— of the ears (posteriorly,) | 3⅞ |
| Height, from the fore shoulder, | 11 |
| Length, of the hind foot, | 4½ |
| ——— of the middle hind claw, | 5⅛ |
| ——— tail, (vertebræ,) | 2½ |
| ——— tail, including fur, | 3 |

Weight of a female killed in the spring—it was suckling its young, and not in good condition—6 lbs.

*Geographical Distribution.* I have not heard of the existence of this animal to the east or north of the State of Alabama, but it is numerous in all the swamps of the western parts of that State, is still more abundant in the State of Mississippi and in the lower parts of Louisiana, and is frequently brought by the Indians to the market of New Orleans.

*Habits.* The habits of this animal are very singular, differing in one remarkable peculiarity from all the other species yet known, with the exception of the Marsh hare, hereafter to be noticed. Although the Swamp hare is occasionally seen on high grounds in the thick woods, yet it prefers low swampy places, where it can have access to streams and ponds of water, into which it is fond of resorting; swimming with great facility from one little hummock to another, seeking its food in low wet places, and subsisting on various kinds of roots, especially a species of Iris, growing in the water. All the individuals who have given me information on the subject of this hare, have informed me that, when first started, and whilst running, its trampings are louder and heard at a greater distance, than those of any other of our species.

In its leaps and bounds it is apt to startle those who have intruded upon its solitary retreats, and who are oftentimes impressed with a belief that they have started a young deer. When pursued by dogs, it runs with great swiftness, and escapes from them with ease; but it almost invariably pushes for the first pond of water, as if led by instinct to seek an element where all traces of its scent are soon lost to its eager pursuers. I have been informed that it possesses a very common habit, when thus pursued, of swimming to the edges of streams or ponds, retreating beneath the overhanging roots of trees growing on their borders, and seeking for a secure shelter under the hollows made by the washing of the water. Mr. AUDUBON has also assured me that it is not only expert at swimming, but is capable of diving. On one occasion he fired at one of this species, and was surprised to find it diving at the flash of his gun, and he beheld it emerging from the water at the distance of eight or ten feet. The swiftness of foot possessed by this hare, and the stratagems to which it is capable of resorting might easily enable it to elude pursuit; but the habit which it possesses of seeking for a shelter as soon as it is chased, is the cause of its being frequently captured. When the waters in the swamps are

low, it seeks the first hollow tree, where it is easily secured. In this manner, Major LEE informs me that in his vicinity the boys and domestics caught 30 or 40 in three days.

The young of this hare are frequently found in nests formed of leaves and grasses, and placed on some hillock in the swamps, or in the hollow of some fallen tree. I have been informed that it produces young at least twice in a season, and from four to six at a birth.

*General Remarks.* Although all our hares bear a strong resemblance to each other, particularly in their summer pelage, yet all have marks of difference by which they can, with a little attention, be distinguished. The present species, in its colour on the upper surface and in its aquatic habits, is closely assimilated to the Marsh hare. They differ, however, very widely in other respects. The former is a third larger than the latter. The largest Marsh hare out of more than 50 that I have measured, was only 14 inches, whilst the largest Swamp hare was 22 inches, and I am informed that it is often much larger. The tail of the Marsh hare is exceedingly short, its vertebræ being not more than an inch long, whilst that of the present species is

two inches and an eighth, being more than double the length, and longer than that of any species at present known in North America. The ears differ in the same proportion. The under surface of the tail of the Marsh hare is ash coloured, mixed with brown, whilst that of the present species is pure white; its feet thinly covered with hair, and its toes, which are capable of being widely opened, are well adapted to enable this hare and the LEPUS *palustris* to swim, and to pass over marshy and muddy places. Their tracks in the mud leave a distinct impression of the toes, whilst on the contrary the tracks of the American and the two northern hares exhibit no such traces, their feet being so thickly clothed with long hair that even the prints of the nails are scarcely perceptible. The present species is larger than the American hare, being very nearly the size of the Northern hare, and in weight probably exceeds it. Indeed, the two latter species, when divested of their hides, are very nearly equal. But the fur of the Northern hare being much looser and longer, whilst that of the present lays compact and smooth, causes the former to appear larger. It differs from the American hare, in another particular:—whilst the points of the hair, in the latter animal, become white in winter, those of the

Swamp hare, become jet black:—whilst the American hare strenuously avoids water, the present species plunges fearlessly into it, and finds it a congenial element.

### 4. LEPUS *Americanus*. American Hare.

LEPUS *Americanus*, HARLAN, GODMAN. Figured in AUDUBON'S Birds of America, vol. 1. plate 51, in the talons of FALCO *borealis*.

This species is so common, so widely diffused, and so generally known, that the short description I shall add, is only intended to give the readers of this article an opportunity of conveniently comparing it with our other species; and in my account of its habits, I shall principally confine myself to such observations as I have been enabled to make on this species, which do not appear to have been noticed by other writers.

*Dental Formula.* The same as in the other species of this genus.

*Dimensions.* There is a considerable difference in the size of different individuals, but, I am

inclined to the belief that a full grown animal will usually be found to measure more than 14 inches. I will give the measurement of a well grown old male, now before me, which I consider as of the usual size.

| | |
|---|---|
| Length of head and body, | 15 in. |
| ——— of the head, | 3½ |
| ——— of the ears, | 3 |
| ——— tail, (vertebræ,) | 1¼ |
| ——— of the tail including fur, | 2¼ |
| ——— from heel to the end of middle claw, | 3⅝ |

In its summer dress, the fur on the upper part is yellowish brown; rufous on the outer surface of the fore and hind-legs; beneath, and under surface of the tail, white. In winter the upper surface is considerably lighter. Dr. GODMAN states, that at this season it is altogether, or nearly, white. But in no part of the United States, can it be said to become white. In Carolina it is, in winter, of a light iron-gray. In the neighbourhood of Boston, the tips at the end of the fur are more broadly edged with white; still, however, there are so many black hairs interspersed throughout the fur, and the brown colour of many hairs is so visible at the surface, that in every part of the United States it retains the name of Gray rabbit.

This species is widely diffused. It exists nearly from one extremity of the United States to the other. It is found in abundance in the New England states, and as far westward as the Mississippi; and it was seen by BARTRAM, and by the officers of the recent campaign, in the high grounds of Florida. There are, however, some intermediate districts in which it either does not exist, or is very rare. About 30 years ago, it was not known in the neighbourhood of Troy, in the State of New York. The Northern hare was then very abundant. The American hare soon after made its appearance in very small numbers, and, in proportion to its increase, the former began to grow more scarce. For a time they continued to be found in the same neighbourhood; but, whether the two species were not reconciled to each other, or what is more probable, that the Northern hare was more hunted than the other, it has now become comparatively scarce, whilst the American hare is exceedingly numerous.

This is one of the most prolific of all our species. In the northern states, it produces young about three times in the season, of from five to seven at a birth; whilst in Carolina, its young are frequently found as early as the first of February, and as late as the middle of October. Nature seems thus

to have made a wise provision for the preservation of the species, since no animal is more defenceless or possesses more numerous enemies. Although it runs with considerable swiftness for a short distance, yet it soon becomes wearied; and an active dog would overtake it, did it not retreat into some hole of the earth, into heaps of logs or stones, or into a tree with a hole near its roots. In these retreats it is often captured by young hunters. In the northern states where the burrows of the Maryland marmot (ARCTOMYS *monax*) and skunk (MEPHITIS *Americana*) are numerous, this hare retreats to their holes, from which it would require more labour to unearth it, than it is worth, and where it is generally left unmolested. Even here, however, it is not always safe from the intrusion of carnivorous animals. The skunk, though comparatively clumsy, often captures and devours it in these retreats. But its most persevering and formidable enemy is the ermine, which follows its track, like a hound, until it retires to the earth, or to a hollow tree, where its little pursuer—not one-sixth in size—soon overtakes and kills it. The head is eaten off, and the body left to remain till a want of food compels it to return. Whilst residing in the state of New York, many years ago, I was desirous of pre-

serving a number of this species during a winter when they were hunted with such avidity, that I began to fear the race, in that vicinity, would be nearly extirpated. My design was to set them free on the following spring. Recollecting that I had then in confinement a number of the two species of weasel (MUSTELA *vulgaris* and MUSTELA *erminea*,) in order to ascertain their change of colour,* I suggested to a servant the probability of their being easily taken by means of these animals. He accordingly provided himself with a dog, by means of which the hares were soon driven to the holes where, in the time of danger, they usually resorted. The weasels were carried in a small tin box, and a thin line fastened to their necks. The common weasel (MUSTELA *vulgaris*) appeared most timid, and refused to enter the hole; but an ermine, although captured but a few days, entered readily. The man found it necessary to file its teeth, to prevent it from killing the hare. Thus guarded the ermine pursued the hare to the end of the hole, when the latter hurried to

* The common weasel retained its yellowish brown colour above, throughout the winter. The ermines, although some of them were but six months old, became snowy white. GODMAN, on the authority of BONAPARTE, states that the ermine is the only species of weasel existing in this country. In this he is certainly in error.

the mouth, and was taken alive by the hand. Although the hare would retreat high up into the hollow of a tree, yet thither its relentless persecutor would follow it, and instantly force it down. In this way he procured twelve in one morning, and upwards of fifty in the course of three weeks, when I had to request him to desist. I have, on several occasions, seen the tracks of this hare on the snow, giving evidence by its long leaps that it had ran under the influence of fear. On a closer examination, I observed the foot-prints of the ermine, as if in close pursuit; and on following the trail, found, at the mouth of some hole, the mutilated remains of the hare. On one occasion, this little marauder had dragged a large hare, which it had killed in the hollow of a tree, to the distance of more than twenty yards, and buried it in the snow. As I have frequently discovered the remains of this hare in summer, when it could not have been pursued by the eye, I have supposed the ermine to possess a strong power of smell, and that it pursued the hare by the scent, like a hound. The Canada Lynx in the northern states and the Wild Cat (FELIS *rufa*) of the south, as well as Foxes, capture this hare by stealth; various species of hawks and owls, especially of the latter, prey upon them. The rattle-snake is

occasionally killed with this species in its body; and I have seen one, two-thirds grown, cut from a protuberance in the body of our southern chicken-snake (COLUBER *quadrivittatus, Holbrook.*) It is difficult to conceive in what manner this hare is secured by a reptile possessing no poisonous properties in its fangs, and, withal, rather inactive. Probably, the snake first seized it with its mouth, and then enclosed it in its folds, in the manner ascribed to the Boa constrictor. Various modes are adopted by the Indians and their more civilized neighbours, in capturing this animal. In the northern United States, this hare is pursued by dogs, and either shot or taken from some shelter to which it retires. It is also frequently captured in box-traps, and in snares placed in the gaps of some brush-fence made in the woods for the purpose. In the southern states, it is generally hunted by pointer dogs, and shot at the moment when it leaps from its form.

The habits of this hare, differ in some respects, from all our other species. Instead of confining itself to the woods, like the rest of the hares of America, it is fond of frequenting plantations—occupying little copse-woods in the neighbourhood of cultivation—choosing for its seat by day, the concealment of a brush-heap, or a tuft of grass,

from whence it issues at night to regale itself on the clover, turnip, and corn-fields of the farmer; not unfrequently divesting the young trees of the nursery, of their bark; making frequent inroads upon the kitchen-garden of the housewife, feasting on the young green pease, lettuce, and cabbages; and creating infinite vexation and threats of revenge. When they have once had an opportunity of tasting these dainties, it becomes difficult to expel them from a nightly visit to the enclosure; although the place of their entrance may be carefully closed, they are sure to dig a fresh hole in its immediate vicinity; and snares, traps, or the gun, are the only modes of putting an end to farther depredations.

This animal, when first started, runs with greater swiftness and makes fewer doublings, than the Northern hare. On having advanced a hundred yards, or more, it stops to listen—finding itself pursued by dogs, it pushes directly for its hole. In the lower parts of Carolina, where it finds protection in briar patches, and in places thickly overgrown with Smilax and other vines, it continues much longer on foot, and in its windings and turnings in places inaccessible to larger animals, frequently makes its escape from its pursuers

without the necessity of resorting for shelter to a hollow tree.

The American hare possesses the habit of all the other species of this genus, with which I am acquainted, of stamping with its hind-feet on the earth when alarmed at night, and when the males are engaged in combat. It is also seen, during the spring season, in the wood-paths and along the edges of fields, seeking food late in the mornings and early in the afternoons; and, on such occasions, may be approached and shot with great ease. This species, like all the true hares, has no note of recognition, and its voice is never heard, except when wounded, or at the moment of its capture, when it utters a shrill plaintive cry, like that of a young child in pain. In the Northern hare this cry is louder and shriller, and of longer continuance. The common domesticated rabbit seems more easily excited to this, than any other of the species.

Dr. RICHARDSON, in his work on the American quadrupeds, expresses an opinion from a careful examination of many specimens in different states, that the change to the winter dress in the Northern hare, is effected, not by a shedding of its hair, but by a lengthening and blanching of the summer fur. Having watched the progress of this change, in the

present species in a state of confinement, and having also examined many specimens at all seasons of the year, I have arrived at the opposite conclusion, with regard to the American hare. In autumn, most—if not all—the summer fur drops off in spots, and is gradually replaced by its winter coat. In this state the animal presents a somewhat singular appearance, exhibiting at the same time as in the Northern hare, although less prominent, patches of different colours.

The American hare, although it breeds freely in enclosed warrens, seldom becomes as tame as the domesticated rabbit. It seems to be constantly engaged in trying to find some means of escape; and though it digs no burrows in a state of nature, yet, when confined, it is capable of digging to the depth of a foot or more under a wall, in order to effect its escape. I have only in one instance, at the house of Dr. De Benneville, near Philadelphia, seen five or six, that were taken from the nest when very young and brought up by hand, so completely tamed, that they came at the call, leapt on the lap of their feeder, and lived sociably and without restraint in the yard among the dogs and poultry. The former, although accustomed to the chase of the wild of this species, never molest-

ed those who had grown up with them, and now seemed to make a part of the motley family of the poultry yard. Such is the intelligence of the canine race, that I have observed dogs not only associate with the hare thus tamed, but I have seen the hounds accustomed to the chase of the wild deer, eating from the same platter with one domesticated in the yard, and not only refraining to molest it, but defending it from the attacks of strangers of their own species, who happened to come into the premises; and when this deer, which occasionally visited the woods, was started by the pack of hounds here referred to, they refused to pursue it.

5. LEPUS *palustris*. Marsh Hare. pl. 15 & 16.

LEPUS *palustris*. (BACHMAN.) Page 194, ante.
LEPUS *palustris*. AUDUBON'S Birds of America, vol. 4. plate 366.

*Characters*. Smaller than the American hare. Ears much shorter than the head; eyes rather small; tail very short; feet small, thinly clothed

with hair. Upper surface, yellowish brown; beneath, gray.

*Dental formula.* Incisors $\frac{4}{2}$, Canines $\frac{0-0}{0-0}$, Molars $\frac{6-6}{5-5}$ 28.

The upper incisors are longer and broader than those of the American hare, marked, like all the rest of the species, with a deep longitudinal furrow. The small accessary incisors are smaller and less flattened than those of the last mentioned species, and the molars are narrower and a little shorter. The transverse diameter of the cranium is much smaller, the vertical diameter about equal. Orbits of the eyes one-third smaller. This is a striking peculiarity, giving it a smaller and less prominent eye than that of any other American species. The pterigoid processes of the temporal bone project downwards nearly in a vertical line, whilst those of the American hare, are almost horizontal.

Head and ears shorter than those of the LEPUS *Americanus;* legs short, and rather small; body short and thick; feet small, thinly clothed with hair beneath, so as not to cover the nails, which are larger than those of the American hare. Tail shorter than that of any other species of true hare inhabiting the United States, except the LEPUS

*Nuttalii*. Hair on the back, long and somewhat rough. From the short legs and ears of this species, and its general clumsy habit, it has the appearance when running through the marshes, splashing through mud and mire, and plunging into creeks and ponds of water, of some large Norway rat, hastening to escape from its pursuers.

*Colours*. The teeth are yellowish white; the eyes are dark-brown, appearing in certain lights, quite black. Upper parts of the head, brown and grayish ash. Around the orbits of the eyes slightly fawn coloured. Whiskers black. Ears dark grayish brown. The back and whole upper parts yellowish brown, intermixed with many strong black hairs. The hairs, when examined singly, are blueish gray at the roots, then light brown, and are tipped with black. The fur, beneath, is light plumbeous. Under the chin, gray; throat yellowish brown; belly light gray, the fur beneath, blueish. Under surface of the tail, ash colour, edged with brown. During winter the upper surface becomes considerably darker than in summer.

*Dimensions*—Taken from a specimen in the flesh:

| | |
|---|---|
| Length, from point of nose to insertion of tail, | 13 in. |
| Height, from the top of the fore-shoulder to the end of middle claw, | 7 |
| Length of the head, | 3½ |
| ——— of the ears, | 2½ |
| ——— of the hind-foot, | 3 |
| ——— of the tail, (vertebræ,) | ⅝ |
| ——— of the tail, including the fur, | 1½ |
| Weight, | 2½ lbs. |

*Geographical Distribution.* I have not heard of the existence of this small species of hare to the north of the state of South Carolina, nor is it found in the upper parts of this state,—confining itself to the maritime districts, to low marshy grounds partially inundated, to the borders of rivers subject to the overflowing of their banks, and to the ponds, usually termed reserves, where the waters intended to overflow the rice-fields are preserved. In these situations, rendered almost inaccessible on account of mud, entangled vines, and stagnant waters, sending up poisonous miasma—the fruitful sources of disease,—surrounded by frogs, water-snakes, and alligators, this species resides through the whole year, scarcely molested by man. In these forbidden retreats, frequented

by cranes, (ARDEA,) snake-birds, (PLOTUS *anhinga*,) and ibises, this almost aquatic quadruped finds a home suited to its habits; making up for its want of speed in eluding pursuit, by its facility in winding through miry pools and marshes overgrown with rank weeds and willows. In such situations, I have met with it fifty miles north of Charleston; but, as soon as the traveller arrives at the high grounds of the middle country, where the marshes disappear, this hare is no longer seen. It is common in all the lower parts of Georgia, and I have observed it for sale in the market of Savannah. It is abundant in East Florida, even to its farthest southern extremity. I received a living animal of this species, taken on one of the islands near Indian Key, called Rabbit Key, separated from the main-land by several miles of sea; where it could have proceeded only by swimming, but where it is now found in great numbers. In all the low grounds of Florida, this species takes the place of the American hare, which has not been observed in those situations.

*Habits.* The Marsh hare is one of the most singular in its habits, of all the species. It runs low on the ground, and cannot be said to possess the fine leaping gait of the American hare. It is

so slow of foot, that nothing but the sheltered and miry situations in which it resides can save it from being easily overtaken and captured. I have, indeed, observed the domestics on a plantation, during a holyday, setting fire to a piece of marsh ground, in a very dry season, and armed with clubs, waiting till the flames drove these hares from their retreats, when they were run down and killed in considerable numbers. I noticed that when the American hare made its appearance it was suffered to pass, on account of the speed they knew it to possess, but no sooner did the Marsh hare appear, than with a whoop, they gave chase, and seldom failed to overtake it.

The feet of the Marsh hare are admirably adapted to its aquatic habits. A thick covering of hair on its soles, like that on the other species, would be inconvenient; they would not only be kept wet for a considerable length of time, but would retard them in swimming. All quadrupeds that frequent the water, such as the Beaver, Otter, Muskrat, Mink, &c., and aquatic birds, have nearly naked palms; and it is this peculiar structure, together with the facility in distending its toes, that enables this quadruped to swim with such ease and rapidity. Its track, when observed in moist or muddy situations, differs very much from

that of the other species. Its toes are spread out, each leaving a distinct impression, like those of the rat.

The Marsh hare deposits its young in a pretty large nest, composed of a large species of rush, (JUNCUS *effusus*,) growing in a convenient situation. These appeared to have been cut into pieces of about a foot in length. I have seen these nests nearly surrounded by, and almost floating on, the water. They were generally arched, by carefully bending the rush grass over them, admitting the mother by a pretty large hole in the side. A considerable quantity of hair was found lining the nest, but whether plucked out by the parent, or the effect of the season, (it being late in spring when these animals shed their coat,) I was unable to ascertain. The young were from five to seven. They evidently breed several times in the season, but I have observed that the females usually produce their young two months later, at least, than the American hare. Twenty-one specimens were obtained from the 9th to the 14th day of April; none of the females had produced young that season, although some of them would have done so in a very few days. On one occasion only, have I seen the young in March. These bear a strong resemblance to the adults and may almost at a

glance be distinguished from those of the last-mentioned species.

This species possesses a strong marshy smell at all times, even when kept in confinement, and fed on the choicest food. Its flesh, however, although dark, is fully equal, if not superior, to that of the American hare. The Marsh hare never visits gardens or cultivated fields, confining itself throughout the year to the marshes. It is occasionally found in places overflown by salt or brackish water, but seems to prefer fresh-water marshes, where its food can be most conveniently obtained. It feeds on various grasses, gnaws off the twigs of the young sassafras, and of the pond spice (LAURUS *geniculata.*) I have seen many places in the low-grounds, dug up, the footprints indicating that it was the work of this species in search of roots. It frequently is found digging for the bulbs of the wild potato (APIOS *tuberosa*) as also for those of a small species of amaryllis (AMARYLLIS *atamasco.*)

I possess a living animal of this species, which was sent me a few weeks ago, having been captured when full grown. It became so gentle in a few days that it freely took its food from the hand. It is fed on turnips and cabbage leaves, but prefers bread to any other food that has been offered

to it. It is fond of lying for hours in a trough of water, and seems restless and uneasy when the trough is removed—scratching the sides of its tin cage until it has been replaced, when it immediately plunges in, burying the greater part of its body in the water.

It has already shed a great portion of its summer, and resumed its winter, dress. The hairs on the upper surface, instead of becoming white at the points, as in the American hare, have grown long and black, through which the brownish parts beneath are still distinctly visible.

This species, like all others of the genus existing in this country, as well as the deer and squirrels, is infested with a troublesome larva of an oestrus in the summer and autumn; which, penetrating into the flesh, and continually enlarging, causes pain to the animal and renders it lean. One of these larva dropped from an orifice in the throat of the hare which I have in confinement. It was of the usual cylindrical shape, but appears to differ in some particulars from the oestrus cuniculi. I have endeavoured to preserve it in order to examine the perfect insect. On placing it in a jar of earth it immediately penetrated the ground to the depth of several inches, where it still remains. (February 1.)

## 6. LEPUS *Nuttallii*. NUTTALL'S Little Hare. pl. 22. No. 1.

To the kindness and liberality of THOMAS NUTTALL, Esq., whose repeated and perilous journeys over the prairies, the mountains, and through the forests of the far West, have raised him to a high rank among modern travellers; and whose researches, as a Botanist, are duly appreciated by all men of science—I am indebted for a new species of hare, which I am now about to describe:—the most diminutive of any species of true hare yet discovered; and in size and colour bearing a strong resemblance to L. LAGOMYS *princeps* of RICHARDSON.

*Characters.* Very small; tail of moderate length; general colour above, a mixture of light buff and dark brown; beneath, light yellowish gray; ears broad and rounded; lower surface of the tail, white.

The upper anterior incisors are more rounded than those of the American hare, but in the deep longitudinal furrows, and in other particulars, they

bear a striking resemblance to those of that species; the accessory upper incisors, resemble those of the hares in general. The lower incisors are rather thinner than those of the American hare, and like the upper, more of an oval shape. The upper grinders are furrowed longitudinally, like those of other hares, and have a slight furrow on the inner side, but not more apparent than that of LEPUS *aquaticus;* indeed, all the American hares have this furrow, which differs considerably in individuals belonging to the same species.

*Shape.* This quadruped bears some resemblance to the young of LEPUS *Americanus.* The forehead is more arched, and there is no depression in the frontal bone, as in the other American hares. Its fur is also much softer, and differs in colour. The whiskers are nearly the length of the head. The ears appeared rather short and shrivelled in the dried specimen, but when moistened for the purpose of having a drawing made of them, became much distended. The incurvation on their outer margins was as distinct as that of other hares, bearing no resemblance to the funnel-shaped ears of the pika. The tail in the living animal must be conspicuous, although in

the dried specimen it is concealed by the long fur of the posteriors. The feet are thickly clothed with soft hair, covering the nails completely. There are five toes on the fore, and four on the hind-feet.

*Colour.* The teeth are yellowish white; whiskers, white and black, the former colour predominating. The whole of the upper surface of the body, a mixture of buff and dark brown; the under surface light buff gray. The fur on the back is for three-fourths of its length from the roots, of a plumbeous colour, then light ash, mixed with buff; and the long interspersed hairs are all tipped with black. The ears are pretty well clothed internally and externally, with hairs of an ash colour, bordered with a line of black anteriorly, and edged with white. From behind the ears to the back there is a very broad patch of buff, and the same colour, mixed with rufous, prevails on the outer surface of the legs, extending to the thighs and shoulders. The soles of the feet are yellowish brown. The claws, which are slightly arched, are light brown for three-fourths of their length, and tipped with white. The under surface of the tail, white.

| | |
|---|---|
| Length, from point of nose to insertion of tail, | 6¾ in. |
| ——— of heel, | 2 |
| ——— of fur on the back, | ¾ |
| ——— of head, | 2¼ |
| Height of ear, | 1½ |
| Tail, (vertebræ,) | ¾ |
| ——, including fur, | 1¼ |

The only information which I have been able to obtain of the habits of this little hare, is contained in the following note from Mr. NUTTALL, which accompanied the specimen:—

"This little hare we met with west of the Rocky Mountains, inhabiting thickets by the banks of several small streams which flow into the Shoshonee and Columbia rivers. It was frequently seen, in the evening, about our encampments, and appeared to possess all the habits of the LEPUS *Americanus*."

## 7. LEPUS *campestris*. Prairie Hare.

L. *Virginianus*. RICHARDSON, non HARLAN.
*Prairie hare*, of the Fur Traders.

In order to render our account of the North American hares as complete as possible, we introduce here a species which has never yet fallen under our observation, and is still very imperfectly known. It inhabits the vast unwooded plains which occupy the central portion of the Continent—beyond the settled parts of the United States.

Dr. RICHARDSON, in his Fauna Boreali-Americana, says:—

"It is a common animal on the plains through which the North and South branches of the Saskatchewan flow, and which extend as far eastward as the Winepegoosis, and southern extremity of Winnepeg Lake, and to the southward, unite with the plains of the Missouri, where this hare is also found, as well as on the great plains of the Columbia. I have not heard of its existing further north than latitude 55°. It frequents the

open plains, where it lives much after the solitary manner of the common European hare, without burrowing; it is, also, occasionally met with among the small clumps of poplars and willows, with which the plains are studded near their confines; but it does not resort to the thick woods like the American hare, [Northern hare.] It possesses great speed. I was not successful in the attempts I made to obtain specimens of this hare, a mutilated hunter's skin, in the winter dress, being all I could procure. Mr. DRUMMOND killed a full grown individual on the banks of the Saskatchewan, in the month of September, and remarked that, as far as his recollection went, there was no difference betwixt it and the common English hare. Owing to a succession of wet weather, and want of convenience for drying specimens, the skin unfortunately became putrid, and was thrown away."

"*Description*—Of a mutilated winter skin. The fur is not quite so dense and fine, as that of the Polar hare, but more so than that of the American hare, [Northern hare.] It is every where of a pure white colour on the surface, except on the borders of the ears. The whiskers and muzzle are white. There are no coloured rings round

the eye, but when the fur is blown aside, it is seen to be of a very pale wood-brown or fawn colour, for about two-thirds of its length from the roots upwards. On the upper aspect of the head, the wood-brown colour of the concealed parts of the fur is deeper, and is mixed with a little blueish gray. On the cheeks, the fur is longer, and white to very near the roots, where it is blueish gray. On the sides of the neck, the fur is blueish gray for a short space, at the roots, then of a buff colour, intermediate between pale wood-brown and cream-yellow, for two-thirds of its length; and, lastly, white at the tips. On the *back*, the fur is white for one-third of its length from the roots, then pale brownish yellow, or buff colour for less than a third; and, lastly, white to the tips. The fur on the *belly* and *legs*, is white its whole length. The *ears* have a pretty broad wood-brown or fawn coloured border along their anterior margin, and a narrower one towards the base of the posterior margin; the fur on these borders, is blackish brown towards its roots. The back of the ear, between the fawn coloured margins, is covered with entirely white fur. The ear has a brownish black tip, about the same size with the black tip of the ear of the Polar hare."

| | | |
|---|---|---|
| " Length of the head and body, | 22 | in. |
| ——— of the fur of back, | 1½ | |
| ——— of the fur of belly, | 2½ | |
| ——— of the whiskers, | 3½ | |
| ——— of the ears, measured posteriorly, including fur, | 4 | |
| ——— of ears, from rictus to apex, without fur, | 3 | |
| ——— of fur, at tip of ear, | ½ | " |

The following description of this species of hare, is by LEWIS and CLARK:—

"They weigh from seven to eleven pounds; the eye is large and prominent, the pupil of a deep sea green, the iris of a bright yellow and silver colour; the head, neck, back, shoulders, and outer parts of the legs and thighs, are of a lead colour; the sides, as they approach the belly, become gradually more white; the belly, breast, and inner parts of the legs and thighs, are white, with a light shade of lead colour; the tail is covered with white, soft fur, not quite so long as on the other parts of the body; the body is covered with a deep, fine, soft, close fur. The animal assumes these colours from the middle of April to the middle of November; during the rest of the year it is of a pure white, except the black

and reddish brown of the ears, which never changes. In March, a few reddish spots are sometimes mixed with the white on the head and upper parts of the neck and shoulders. This animal can leap twenty-one feet. Its food is grass and herbs, and in winter it feeds much on the bark of aromatic shrubs, which grow on the plains. These hares are generally found separate, and never associate in greater numbers than two or three."

Mr. NUTTALL observes:—

"This species, though seen frequently on the plains of the Platte, is still more common on the plains to the west of the Rocky Mountains. They were frequently killed by our party, but during the summer, they were lean and unsavory food, and at this time, so filled with vermin, as to be almost loathsome; but, in the month of October, the young and old become very excellent;—we found the inhabitants of the fort at Walla Walla, living upon them as a principal article of sustenance; and we now found their flesh very palatable—dark coloured like the hare of Europe, from which it would have been even difficult to distinguish them as food."

## 8. Lepus (Lagomys) *princeps*. (Richardson.) The Little Chief Hare.

Lepus (Lagomys) *princeps*. Richardson. Zool. Jour., No. 12. p. 520. Fauna Boreali-Americana, p. 227., pl. 19.

This diminutive animal, which bears so little affinity to the hares, that it will probably not long remain even as a sub-genus to Lepus, is accurately described by Dr. Richardson, in the works alluded to above.

A specimen, obtained on the Rocky Mountains by Mr. J. K. Townsend, was obligingly sent for my inspection by the Academy; which enabled me to compare it with and to discover the striking difference between it and the preceding species, and to give a short description. It was a male, taken on the 13th of August, 1834.

*Characters.* Head short and thick; ears rounded; legs short; no tail; colour above, blackish brown; beneath, grayish fawn.

The skull and teeth had been removed in the specimen we examined, except the upper incisors.

*Dental formula.* The following is given by RICHARDSON:—

Incisors, $\frac{2-2}{2}$ Canines, $\frac{0-0}{0-0}$ Grinders, $\frac{5-5}{5-5}$ 26.

*Dimensions*—Of the specimen before me:

| | |
|---|---|
| Length of head and body, | 6½ in. |
| ——— from nose to eye, | ¾ |
| Breadth of ear, | ⅝ |
| Fur on the back, | ¾ |
| Length of head, | 2¼ |
| Height of ear, | 1 |
| Length of heel, | 1⅛ |

*Form.* The body of this species is thick; the head is broad and short, and the forehead arched. The ears are ovate and do not appear to have any incurvations on their inner margins. The eyes are small, resembling those of the Arvicola; there is a naked prominent black tubercle at the root of each claw.

*Colour.* The colour of the Little-Chief hare,

resembles in so many particulars that of NUTTALL'S hare, that were we to judge from this alone, the two species might be easily mistaken for each other. They are both subject to considerable variation on different parts of the body. The fur of the present species, is, for three-fourths of its length, of a grayish black colour, then partly yellowish brown and white; on the sides of the head and fore-shoulders, this yellowish brown colour prevails more than in other parts. The ears are bordered with white; the whole under surface is yellowish gray, and the small protuberance, which represents the tail, is light coloured.

*Habits.* Little is known with regard to the habits of this animal.

The following extract is made from the Fauna Boreali-Americana :—

"Mr. DRUMMOND informs me, that the Little Chief hare frequents heaps of loose stones, through the interstices of which it makes its way with great facility. It is often seen at sunset mounted on a stone, and calling to its mate by a peculiar shrill whistle. On the approach of man, it utters a feeble cry, like the squeak of a rabbit when

hurt, and instantly disappears, to re-appear, in a minute or two, at the distance of twenty or thirty yards, if the object of its apprehension remains stationary. On the least movement of the intruder, it instantly conceals itself again, repeating its cry of fear; which, when there are several of the animals in the neighbourhood, is passed from one to the other. Mr. DRUMMOND describes their cry, as very deceptive, and as appearing to come from an animal at a great distance whilst in fact the little creature is close at hand; and, if seated on a gray limestone rock, is so similar, that it can scarcely be discovered. These animals feed on vegetables. Mr. DRUMMOND never found their burrows, and he thinks they do not make any, but that they construct their nests among the stones. He does not know whether they store up hay for the winter or not, but is certain that they 'do not come abroad during that season.' "

To the above account, it affords me pleasure to annex the extract of a letter, which I received from Mr. NUTTALL, on the same subject: —

"Of this curious species of LEPUS, (L. *princeps* of RICHARDSON,) we were not fortunate enough to obtain any good specimens. I found its range to be in that latitude (42°) almost entirely Alpine.

I first discovered it by its peculiar cry, far up the mountain of the dividing ridge between the waters of the Columbia and Colorado and the Missouri, hiding amongst loose piles of rocks, such as you generally see beneath broken cliffs. From this retreat I heard a slender, but very distinct, bleat, so like that of a young kid or goat, that I at first concluded it to be such a call; but in vain trying to discover any large animal around me; at length I may almost literally say, the mountain brought forth nothing much larger than a mole, as I discovered that this little LEPUS was the real author of this unexpected note."

Dr. RICHARDSON states that this animal inhabits the Rocky Mountains from lat. 52° to 60°. The specimen of Mr. TOWNSEND, was procured in latitude 42°, and therefore within the limits of the United States.

*General observations on all of the above species.*

From what has been given in this article, it will be perceived that the LEPUS *glacialis* is an inhabitant of the polar regions, having been seen as far north as our discoveries have as yet extended, ranging across the whole of the northern part of our continent, and found as far south, at

least, as Newfoundland, where it is abundant; occupying a range of more than 30° of latitude. There are, no doubt, wide intermediate spaces, where it is not found. Professor M'Collock, residing at Pictou, Nova Scotia, has not observed it in his vicinity. It generally avoids swampy situations—preferring high grounds, and is often seen along the sides of hills, and in rocky situations. The Lepus *Virginianus*, according to Richardson, is found as far north as latitude 68°, and is known to exist as far south as the mountains of Pennsylvania. The Lepus *Americanus* is believed to exist in all the settled parts of the United States. The Lepus *aquaticus* has not yet been discovered to the east of the State of Alabama, nor to the west of the Mississippi river, or the South of New Orleans, although it will probably be found to extend considerably beyond these limits. The Lepus *palustris* has not been seen north of the maritime districts of South Carolina, or to the west of Geogia, but extends to the southernmost portions of East Florida. The Lepus *Nuttallii* seems peculiar to the district west of the Rocky Mountains. The Lagomys *princeps* has been found from the 42° to the 60° of latitude, and probably extends

along the whole range of the Rocky Mountains—especially in the most elevated regions.

These different species, although they have a strong general resemblance during a period of the year, may yet, by a little attention, be easily distinguished from each other. The L. *glacialis* may be known by its black ears in summer, and by its hairs being snowy white, even to the roots, in winter. The L. *Virginianus* may be recognised in summer by its reddish brown colour, and in winter, by its fur being white at the tips and plumbeous at the base. The L. *aquaticus* may be distinguished from the Northern hare by its never becoming white in winter; from the American hare, by its larger size, by its fur becoming blacker in winter, instead of whiter, as is the case with the former, and by its aquatic habits; and from the Marsh hare by its being one-third larger, by its much longer head, ears, and tail, and by its swiftness of foot. The L. *palustris* may at any time be distinguished, by its short tail which is never white beneath, by its small hind-feet, resembling, in this respect, those of the Cavy, and by its aquatic habits. The L. *Nuttallii* may be known by its diminutive size,—and differs from the LAGOMYS *princeps* by the presence of a tail. The L. *campestris* may be distinguished from the Polar

hare, by the fur on the back never becoming pure white, to the roots, in winter.

In addition to the eight species enumerated in this article it is very probable that one or two may yet be added to our Fauna. The extensive range of the Rocky Mountains has not yet been thoroughly explored by naturalists. I have been informed by my friend, the Hon. J. R. POINSETT, the former minister to Mexico, that he had frequently seen, and hunted a large hare on the pampas near the City of Mexico, of the size of the LEPUS *timidus*, of Europe. ALEXANDER GORDON Esq., of London, an intelligent traveller and a scientific and close observer of nature, has seen this hare in Texas, and it may yet be discovered in some of the extensive prairies in the South-Western portions of our country.

*Some Remarks on the Genus Sorex, with a Monograph of the North American Species.* By JOHN BACHMAN, D. D.; President of the Literary and Philosophical Society of Charleston, South Carolina, &c.

LESS attention appears to have been paid by the naturalists of our country to the quadrupeds belonging to this Genus, than to those of any other. Although several species have been designated few of them have been so accurately described, and figured, as to enable the student of nature to identify the species with any degree of certainty. This is not to be wondered at, when we take into consideration their diminutive size, their nocturnal habits, and their subterranean retreats during the day. The bird, however small, may be detected by its flight and active restless habits. Our larger quadrupeds are pursued and captured on account of the value, either of their flesh, or

skins; or extirpated in consequence of their depredations. But the shrews, being less in size than many of our insects, live in obscure retreats where their habits can only be studied with great difficulty; and are so seldom found, that although their little galleries may be daily seen in our furrows and ditches, not an individual reaches the eye for months.

It was not, indeed, till a recent period (1756) that more than one species of this Genus was known to exist on the Eastern Continent. The celebrated Dr. GALL, who, in his early years; was an enthusiastic student of natural history, devoting himself particularly to an examination of the smaller quadrupeds, made known to Professor HERMANN of Strasburgh, the existence of three new species. M. GEOFFROY ST. HILLAIRE subsequently published descriptions of several new species existing in France; and the number of European species has since been considerably augmented by the assiduous labours of naturalists of the present day.

CUVIER, one of the most eminent of modern naturalists, doubted the existence of a single true Sorex in America.

Since then, several species have been added to the Fauna of our country, and Dr. RICHARDSON,

in his Fauna Boreali-Americana, has published descriptions of three species, as existing in the northern parts of our Continent, none of which, if we may judge from his descriptions, have, to our knowledge, been as yet detected in the United States.

We would remark, as an encouragement to naturalists, that in none of the Genera of quadrupeds in our country, is there a greater probability of new discoveries being made; nor a greater necessity for minute investigations in settling the characters by which the species may be recognised, than in this Genus. We are under an impression that the different species of Sorex are restricted to several favourite localities, and that the different portions of our country possess species that are not to be found in others. We have no evidence that any of our species are identical with those found on the Eastern Continent. We even think, that the SOREX *brevicaudus* of SAY, found in Missouri, requires a more careful comparison with the animal found in the middle states, that goes under the same name, before their identity can be fully established. There are, undoubtedly, several species, even in the cultivated districts of the United States, which have not yet been described. We obtained a

specimen in the northern parts of the state of New York, but which we neglected preserving, which, as far as we can recollect after the lapse of twenty years, was a different species from any that we have since seen described; and three years ago, we saw a specimen of another, in the possession of an intelligent naturalist, W. Cooper Esq., of New York, that appeared to be new. Whilst much remains evidently to be done in this department, a good deal of difficulty will be found in defining the different species, in consequence of the difference between the young and adult animals. These often differ, not only in colour, but in the number of their teeth. In Europe, naturalists have for some years been engaged in cutting off nominal species, which can only be done by examining, not only the external forms, size, and colours, but the teeth and heads of many specimens of each. In our own country, naturalists should endeavour to collect and preserve all the specimens that can be procured, so that by possessing a series of each species, in the periods of their different ages, they could be described and figured in a manner not easily to be mistaken. The difficulty in procuring specimens seems to have been considerably overrated. Let our naturalists, in every part of our country,

encourage the farmer to place in spirits every little quadruped of this Genus, that is ploughed up in his fields or dug from his ditches, and they will not fail to procure a considerable number of specimens in a short time. We recently received several shrews, procured by a friend in the country by means of a small board-trap, placed in his rice fields, baited with meat.

In order to contribute the information we have been able to collect on the animals belonging to this Genus, and to stimulate farther inquiries, we proceed to give an account of species of which we have read no descriptions.

### 1. Sorex *Carolinensis*. Carolina Shrew.

*Characters.* Carolina shrew, with a short flat tail; ears not visible; body of a nearly uniform iron gray colour.

| | |
|---|---|
| Length of body, | 3 in. |
| ——— of tail, | $\frac{5}{8}$ |
| ——— head, | 1 |
| ——— of palm to the end of the nails, | $\frac{5}{16}$ |
| ——— hind-feet, | $\frac{3}{4}$ |

*Dental formula.* Intermediary incisors $\frac{2}{2}$, Lateral incisors $\frac{5-5}{2-2}$, Grinders $\frac{5-5}{3-3}$, 34.

The four front teeth are yellowish white with their points deeply tinged with chestnut brown; all the rest are brown, a little lighter near the sockets. The upper intermediary incisors have each, as is the case in most other species of this Genus, an obtuse lobe, which gives it the appearance of having a small tooth growing out from near the roots. The three first lateral incisors are largest; the posterior ones very small; the first and fifth grinders are the smallest; the other three, nearly equal. In the lower jaw, the two first teeth are lobed; the lateral incisors are comparatively large, and crowded near the grinders. The molars are bristled with sharp points, except the last, which is a tuberculous tooth.

The muzzle is moderately long and slender, and pointed with a naked deep lobed lip. The whiskers are composed of hairs apparently all white, a few of those situated in front of the eyes extending to the occiput, the rest rather short. There are no visible ears, even where the fur is removed; the auditory opening is an orifice situated far back on the sides of the head, running obliquely. The

orifice of the eye is so small, that it can only be discovered by the aid of a good magnifying glass. The tail is flat, thickly covered with a coat of close hair, and terminated by a small pencil of hairs. The fore-feet are rather broad for this Genus, measuring a line and a half in breadth—resembling, in some respects, those of the Shrew-mole, (SCALOPS *Canadensis.*) The toes are five; the inner a little shorter than the outer one; the third and fourth nearly equal. The nails are sharp, rather long, a little arched, but not hooked. The hind-feet are more slender than the fore-ones; naked beneath, and covered above, as are also the fore-feet, by a thin coat of short adpressed hairs.

*Colours.* The fur has the same beautiful velvety appearance, with most of the species of this Genus. The colour of the whole body is nearly uniform. It has a considerable lustre on the upper surface, and is in most lights, of a dark iron gray colour, rather darker about the head; on the under surface it has nearly the same general appearance, but is a shade lighter.

*Locality.* This quadruped has been known to us for nearly twenty years. It is found in various

localities, both in the upper and maritime districts of South Carolina. We recently received specimens from our friend Dr. BARRET of Abbeville District; and we have been informed by Dr. PICKERING, to whose inspection we submitted a specimen, and who pronounced it undoubtedly an undescribed species, that it has been observed as far north as Philadelphia.

*Habits.* It is difficult to know much of the habits of the little quadrupeds composing this Genus. Living beneath the surface of the earth—feeding, probably, principally on worms and the larvæ of insects, shunning the light, and restricted to a little world of their own, best suited to their habits and enjoyments—they almost present a barrier to the prying curiosity of man. They are occasionally turned up by the plough on the plantations of the south, when they utter a faint squeaking cry, like young mice, and make awkward and scrambling attempts to escape, trying to conceal themselves in any tuft of grass or under the first clog of earth that may present itself. On two occasions their small, but compact nests were brought to us. They were composed of fibres of roots and withered blades of various kinds of grasses. They had been ploughed up

from about a foot beneath the surface of the earth, and contained in one nest five, and in the other six, young. In digging ditches and in ploughing in moderately high grounds, small holes are frequently seen running in all directions, in a line nearly parallel with the surface, and extending to a great distance, evidently made by this species. We observed, on the sides of one of these galleries, a small cavity containing a hoard of coleopterous insects, principally composed of a rare species (SCARABÆUS *tityus*,) fully the size of the animal itself: some of them were nearly consumed, and the rest mutilated, although still living.

2. SOREX *longirostris*. Long-Nosed Shrew.

*Characters.* Nose long; ears large and prominent; general colour chestnut.

*Dental formula.* Intermediate incisors $\frac{2}{2}$, Lat. Incisors $\frac{3-3}{2-2}$, Grinders $\frac{4-4}{3-3}$, 28.

I have recently had an opportunity of examining

4

1. SOREX CAROLINENSIS. 3. —— CINEREOUS.

2. —— LONGIROSTRIS 4. —— DEKAYI

another specimen of S. *longirostris*—an old male precisely of the size and colour of the one figured —his dentition was as follows :—

Intermediate incisors $\frac{2}{2}$, Lateral incisors $\frac{5-5}{2-2}$, Grinders $\frac{4-4}{3-3}$, 32.

I am apprehensive the teeth in my other specimen were deficient.

*Description.* The nose is very long; the whole upper jaw is bordered with whiskers, extending to the middle of the ear; the lower, sparsely covered with the same kinds of hair, but shorter; extremity of the muzzle naked, deeply indented and two-lobed; the eyes are distinctly visible, and larger than in most of the species of this genus; the ear extends considerably beyond the fur, is comparatively large, and thickly clothed within and without with short soft hairs; the auditory opening is covered with a large oblong lobe, on which are sprinkled a few stiff, long hairs; tail square, clothed with short hair above and beneath, as also the feet and palms to the extremity of the nails; toes five; the whole body is slender, and the feet are small and weak.

The fur above is close, fine and glossy. This quadruped is of an uniform chestnut colour, a little lighter beneath; muzzle of the nose, in the dried specimen, black; points of the teeth dark brown; nails horn colour, tipped with black.

*Dimensions.*

| | |
|---|---|
| Length from the nose to the origin of the tail, | 1⅛ in. |
| ——— of the tail, | 1 |
| ——— of the head, | ⅛ |
| Height of the ear, | ¼ |
| Length of hind-foot, from heel to the end of the nails, | ⅛ |

The specimen from which the above description was taken, was obtained in the swamps of Santee by Dr. ALEXANDER HUME. His labourers found it whilst digging a ditch through grounds nearly overflowed with water.

We have only seen one other individual of this species, which was obtained in a singular manner. Whilst at the house of a relative in Colleton District, his huntsman brought in some wild ducks, and among the rest a Hooded Merganser (MERGUS *cucullatus.*) There was a protuberance on the throat of this bird, appearing as if it

had not fully swallowed some article of food at the time it was killed. On opening the throat, it was found to contain this little shrew, which was neither much mutilated or decayed.

From the above circumstances, we are induced to think this quadruped aquatic in its habits.

### 3. Sorex *cinereus*. The Cinereous Shrew.

*Characters.* Small feet; eyes small but visible; ears not perceptible; dark iron gray above, and silver gray beneath.

*Dental formula.* Intermediate incisors $\frac{2}{2}$, Lateral incisors $\frac{3-3}{0-0}$, Grinders $\frac{4-4}{4-4}$, 26.

*Dimensions.*

| | |
|---|---|
| Length from nose to origin of tail, | $2\frac{3}{8}$ in. |
| ——— of the tail, | $\frac{7}{8}$ |
| ——— of head, | $\frac{1}{4}$ |
| ——— of nose from upper incisors, | $\frac{1}{8}$ |
| ——— from nose to eye, | $\frac{5}{15}$ |
| ——— of hind-foot, from heel to end of nails, | $\frac{7}{16}$ |

*Form.* The head is rather short when compared with that of the S. *Carolinensis.* The whole upper lip is sparsely bordered with whiskers reaching to the ears; extremity of the muzzle two-lobed, and naked; the ear is not perceptible; tail nearly round, slightly flattened at the end, clothed with short hairs; feet small and slender; palms of the fore-feet a little more than half the size of S. *Carolinensis*; both the fore and hind-feet covered with short adpressed hairs extending to the roots of the nails; nails moderately long, slightly arched.

*Colour.* The teeth are white and at the ends nearly black; fur soft, close, and lustrous; it is dark iron gray above, and blueish gray at the roots; the belly and sides dingy white, or silver gray; the line of separation, between the colours of the upper and lower surface is distinctly drawn; nails white.

The above description and measurements were taken from six specimens procured at Goose Creek about twenty-two miles from Charleston, by Mr. W. Wesner. They were ploughed up from time to time from an old field which had laid in an uncultivated state for some years and was partially overgrown with weeds and bushes. We

have received about twenty other specimens from various parts of the low country of Carolina—all of the size and colour of the above.

This diminutive animal may be easily distinguished from the S. *Carolinensis* by its smaller size, lighter colour beneath, and the size and form of the fore-feet. But whilst it may, at first sight, be known as a different species from the S. *Carolinensis*, we have found a much greater difficulty in separating it from SAY'S S. *parvus*. The differences in measurement and colouring are not so great that they might not be reconciled, and we felt at one time a strong inclination to set it down as that animal: but knowing the strong general resemblance of the different species of shrews to each other, being able to make nothing of the diminutive figure of GODMAN, and thinking it highly probable that on a comparison of specimens they might be found to differ materially; perceiving, also, that Dr. RICHARDSON, in his Fauna Boreali-Americana, (vol. 1., page 8.,) has published a description of a SOREX under the same name, which differs so widely from the one above described and from SAY'S, that we do not believe it belongs to either species, we have concluded to publish it under the above name. We have added the best figure we were able to procure

leaving it for future naturalists to determine by authentic specimens whether, instead of cutting off species and adding synonymes, it may not be necessary to supply a specific name to the SOREX described by RICHARDSON.

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*April*, 1837.—Since the above was written, we have been furnished with a number of specimens of shrews, which enable us to notice several other species, existing in the United States. A specimen was procured for us by Dr. THOMAS M. BREWER of Boston; another, which had been sent for the Academy of Natural Sciences by Professor JOHNSON, was submitted to our inspection; and W. COOPER, Esq., of New York, having ascertained that we were investigating this difficult Genus, with characteristic liberality, sent us his whole and interesting collection, with his notes, which proved of great service in preparing the remainder of this article. We take pleasure in acknowledging the above instances of kindness and liberality. It is by such means only, and not by locking up in our own cabinets specimens which might enable others to give descriptions, that true science can be promoted.

4. SOREX *Dekayi.* (*Cooper.*) DEKAY'S Shrew.

This is the species which (as we mentioned in a former communication) we saw in the cabinet of Mr. COOPER. It has, we believe, been usually considered identical with the S. *brevicaudus* of SAY. It proves, however, to be a distinct species, larger in size, more robust in shape, and differing in colour.

*Characters.* Larger than the short-tailed shrew; rusty gray colour above, cinereous beneath; tail short and cylindrical.

*Dental formula.* Incisors $\frac{2}{2}$, Lat. incisors $\frac{5-5}{2-2}$, Grinders $\frac{4-4}{3-3}$, 32.

The two upper incisors are much curved and pointed at tip; the lateral incisors are all crowned with two tubercles, except the fifth, which is smooth; each of the grinders is furnished, on the

upper surface, with four sharp points; in the lower jaw, the incisors are also much curved; the first intermediate incisor is smaller than the second; and the molars are similar to those in the upper jaw. From this description of the number and character of the teeth, it will be observed how exactly they correspond with the skull of the individual described by Dr. HARLAN as having been received from Mr. ORD, and referred to S. *brevicaudus*. Although he observed but three grinders in the upper jaw—he probably overlooked the small posterior grinder, or his specimen might have been that of a young animal, with the dentition incomplete. Both the allied species, however, have certainly thirty-two teeth. His specimen, also, having been obtained from the neighbourhood of Philadelphia, where this species exists, and where the other has not yet been discovered, leaves little room to doubt of his having described the skull of one species, for that of another. The heads of both are now before us, and they differ in several particulars as will be seen hereafter.

*Form*. The body bears a resemblance to that of the Shrew-mole (SCALOPS *Canadensis*) in

shape. Head rather short; nose lobed at tip; the eye is a mere speck, and appears covered by the common integument; there are no external ears: the whiskers spring from the upper lip, anterior to the eye; most of them are short, a few of them extend to the length of the head: the feet are more robust than in any American shrew we have examined, and are clothed with short fine hairs; the tail is round, slightly dilated in the middle; the first and fifth claws, on the fore-feet, are nearly equal in length; the middle claw is the longest, and the second and third equal. On the hind-foot, the inner claw is the shortest; the outer a little longer; the second and third equal.

*Colour.* The teeth are white at base, broadly tipped with dark brown, and towards the points quite black, except the small posterior intermediate incisor, which is white. The whole of the upper surface is dark rusty gray, appearing hoary and lustrous when held to the light; below cinereous; point of nose nearly black; whiskers dark gray; feet light brown in some specimens, much darker in others; nails white.

| | |
|---|---|
| Length from nose to origin of tail, | 4 in. |
| Length of head, | 1⅛ |
| Breadth across the head, | 11/16 |
| Length of tail, | ¾ |
| Length of hind-foot from heel to end of nails, | ½ |

In this species we observed some of the specimens rather lighter coloured than others, and a slight difference in the length of tail. Out of four specimens which we examined, the tails of some were a little less than three-fourths of an inch; but in none were they an inch long.

We have received specimens of this animal from Mr. COOPER, who obtained them in New Jersey. We possess another from Albany, and have heard of its existence in Maryland, Virginia, and New England. Its habits must be left to some resident naturalist to describe.

The specimens, from which this description was made, were labelled with the above name. From a memorandum found among the notes which Mr. COOPER kindly transmitted to us, we think it possible, that a description of it was read before some society, or perhaps, published in some scientific journal, to which we have had no access. He is, under any circumstances, entitled

to the credit of having first named, and designated it as a new species.

### 5. Sorex *brevicaudus*. (Say.)

Long's Expedition, vol. 1., page 164.—Godman, vol. 1., page 79., plate 3., fig. 1.—Harlan, page 29.

We are again indebted to Mr. Cooper for a specimen of this rare species, which was sent from the North Western Territory by Messrs. James and Pite. By a careful comparison of this specimen with the S. *Dekayi*, existing in New York and Pennsylvania, which has by many persons been considered as identical with the present, we have been satisfied that our former conjectures, of their being distinct, were correct.

*Characters.* Blackish plumbeous above, a little lighter beneath; smaller than S. *Dekayi;* tail a little longer.

*Dental formula.* Intermediate incisors $\frac{2}{2}$, Lat. Incisors $\frac{5-5}{2-2}$, Grinders $\frac{4-4}{3-3}$, 32.

The teeth are white, brightly tinged with chestnut brown on the points, except the third and fourth lateral incisors in the upper jaw which have merely a brown speck at the tips, and the fifth which is white; the posterior upper molar is small, though larger than that of S. *Dekayi;* the incisors are less curved than those of the latter species; there is also a striking difference in the head, that of the present species being considerably shorter, the skull more depressed and much narrower, appearing about one-fourth less than that of DEKAY'S Shrew.

From the number and appearance of its teeth, it was evidently an old animal.

| | |
|---|---|
| Length from the tip of the nose to the root of the tail, | 3½ in. |
| Length of heel to end of nail, | ⅝ |
| Length of tail, | 1 |
| Length of head, | ¾ |
| Breadth across the head, | ½ |

*Description.* The form of this species is more slender than that of DEKAY'S Shrew, and it appears about one-fifth less; the feet are a little longer and rather large for the size of the animal; the fur on the back is long, nearly double the length

of the other species; the fore-feet are naked; the hind ones sparsely covered with hair; the nose is distinctly lobed; the orifice to the internal ear is large, with two distinct half divisions; the tail, in the dried specimen, appears to be square, sparsely clothed with hair, which extends beyond the tip.

*Colour.* The nose and tail are dark brown; feet and nails white; the whole upper surface of a blackish plumbeous colour; the under surface a little lighter.

## 6. SOREX *Richardsonii.* RICHARDSON'S Shrew.

S. *parvus*, RICHARDSON non SAY.

In our remarks on the S. *cinereus*, which bears some resemblance to S. *parvus* of SAY, we expressed a belief, founded on a comparison of the description of these authors (which differs in many important characteristics) that the S. *parvus* of RICHARDSON, was distinct from that described under the same name by SAY. This impression was forcibly made in consequence of our knowledge of the usual accuracy with which

these naturalists were in the habit of describing their specimens. Since then, we have been able to ascertain that our conjectures were well founded. We recently received from Mr. COOPER, who had obtained them from the North Western Territory, two specimens, so exactly agreeing with the description of Dr. RICHARDSON, that we have no hesitation in referring them to the shrew he described, under the name of another and very distinct species. As the S. *parvus* of RICHARDSON is not the S. *parvus* of SAY, it is necessary to supply a specific name; we have, therefore cheerfully complied with the suggestions of Mr. COOPER, and named it after its first describer, a naturalist who has rendered essential service to the mammalogy of our country.

*Dental formula.* Intermediary incisors $\frac{2}{2}$, Lateral incisors $\frac{5-5}{2-2}$, Grinders $\frac{4-4}{3-3}$, 32.

| | |
|---|---|
| Length of head and body, | $2\frac{3}{4}$ in. |
| ——— of tail, | $1\frac{1}{8}$ |
| ——— of head, | $\frac{7}{8}$ |
| ——— from upper incisors to nostrils, | $\frac{1}{8}$ |
| ——— from eye to point of nose, | $\frac{7}{16}$ |

*Description.* Ears short, about half the length of the fur, covered by short fine hairs; muzzle long and slender, the tip slightly lobed; the whole upper lip bordered with whiskers, reaching to the ears; the tail square, pointed at tip; its body is longer and thicker than that of S. *Forsteri*,—to be noticed hereafter; its feet are slender, partaking, in this respect, of the character of most of the species of this Genus; nails short and slightly hooked.

*Colour.* The fur, from its roots to near the tip, has a dark blueish gray colour; from its closeness, however, this colour is not seen till the fur is removed; the whole upper surface is of a rusty brown colour; beneath cinereous; the feet and nails are light brown.

From this description of the specimens before us it will be perceived that both in size and colour they bear an exact resemblance to the S. *parvus* of RICHARDSON; and having been also obtained from the North Western portions of our country, there can scarcely be any doubt of its being the same species.

### 8. Sorex *Cooperi*. Cooper's Shrew.

This is the most diminutive quadruped that has yet been found on our Continent. It was procured in the North Western Territory, and forwarded to us, with several other rare species, by Mr. Cooper. On comparing it with the S. *Forsteri*, we soon ascertained it to be new, and at the same time, one of the most distinctly marked species in our country. We have named it after the gentleman from whom we received it,—whose untiring labours in various departments of science have contributed so much to advance and embellish the natural history of our country.

*Characters.* Very small; nose long; no external ears; tail as long as the body; colour, dark brown.

*Dental formula.* Intermediate incisors $\frac{2}{2}$, Lateral incisors $\frac{5-5}{2-2}$, Grinders $\frac{4-4}{4-4}$, 34.

5 SOREX RICHARDSONII

6 —— FORSTERI

7 —— COOPERI

8. —— FIMBRIPE

From a careful examination with a good magnifying glass, of the skull of this specimen, we have found two more teeth than have hitherto been discovered in any other American species, except the S. *Carolinensis*. The posterior incisors, in the upper jaw, have a large pointed lobe, resembling a tooth. The four anterior lateral incisors, are conical in shape, not crowded, but leaving a vacant space between them; the fifth is very small, and flat on the crown. The three first grinders appear to be of an equal size,—the posterior one is the smallest. In the lower jaw, the intermediary incisors have three distinct and widely separated lobes, resembling the prints of teeth. The first grinder is a little larger than the rest, which are of equal size. All the teeth are white, and, with the exception of the fifth upper lateral incisor, are tinged with light brown at the tips.

*Dimensions.*

| | |
|---|---|
| Length from point of nose to tail, | 1¼ in. |
| ——— of tail, | 1¼ |
| ——— from eye to point of nose, | ⅛ |
| ——— of head, | ¼ |
| ——— from heel to middle claw, | 7/16 |

*Description.* In form this shrew is very slender,

and more diminutive than the S. *longirostris;* its head is also longer, and its muzzle thinner and more pointed; its legs are slender but long, and the hind-ones strikingly so; they are covered with fine adpressed hairs to the extremities of the nails; its tail is large and thick for the size of the animal, flattened on the sides and beneath, rounded above, clothed with fine hair, and tipped with a pencil of hairs; the eye is small, but visible through the fur, and apparently not covered by an integument; the point of the nose is slightly divided; there is no external ear, and the transverse auditory opening is completely concealed by the fur.

*Colour.* Hair, which is very soft and moderately long, cinereous for two-thirds of its length above, and tipped with shining chestnut brown; beneath with ash colour; feet thickly covered with silvery gray hair; tail above, brown; beneath, silver gray.

9. SOREX *fimbripes*. Fringe-footed Shrew.

For the discovery of this new and strikingly marked species, we are indebted to Professor WALTER R. JOHNSON, the result of whose labours, in other departments of science, may be traced in his various communications to this Society.

*Characters.* No external ears; tail a little shorter than the body; feet broad, fringed at the edges; body of a dark brown colour.

*Dental formula.* Intermediate incisors $\frac{2}{2}$, Lateral incisors $\frac{6-6}{2-2}$, Grinders $\frac{4-4}{3-3}$, 34.

The upper intermediate incisors are much curved, and widely separated; the anterior lateral incisor is simple and appears to be springing from the roots of the front teeth; the four next in succession have two distinct obtuse lobes; the sixth is very diminutive, and perceptible only

with a good magnifier; in the lower jaw the intermediary incisors, which are long, have three prominent lobes, resembling additional teeth; the second lateral incisor is larger than the first, and all the molars are bristled with sharp points.

*Dimensions.*

| | |
|---|---|
| Length from point of nose to insertion of tail, | 2¼ in. |
| ——— of tail, | 1¼ |
| ——— from orifice of ear to point of nose, | ⅛ |
| ——— from eye to point of nose, | ⅛ |
| ——— of heel to end of middle claw, | ¼ |
| Breadth of fore-feet, | 3/16 |
| Length of whiskers, | 1 |

*Form.* The body is a little less in size than that of FORSTER's Shrew, and is not very unlike to it in colour. It differs, however, from that, and every other known species, in many particulars. Its muzzle is long, moveable with the tip slightly lobed; the head is large and flat; the eye is a mere speck, covered by the common integument, and is found with great difficulty; the whiskers are long, extending considerably beyond the head; there are no external ears and the transverse auditory opening is smaller than that of any other

American species that we have seen; the fore-feet are broad and singularly formed, bearing some resemblance to the fins of a turtle; the interior toe is the shortest, the third and fourth of about equal length, and the exterior a little longer than the interior one; on the hind-foot, the inner toe is the shortest, the next a little longer, and the fourth the longest; they are armed with sharp claws; those of the hind-feet are much longer than the rest; the feet are clothed with short fine hairs extending to the extremities of the nails; the edges on the lower surface are fringed considerably, beneath the palms, with much longer brownish hairs; from this singularity of formation so different from all our other species, we have chosen the specific name; the tail is of a moderate size, square, gradually tapering to the point; the fur is considerably longer than in any other of our species of the same size. This species approaches nearer to the GENUS *Mygale* of CUVIER, than any other yet discovered in America.

*Colour.* The teeth are yellowish at base; broadly tipped with light brown; whiskers white; a lightish edge around the upper lip; the feet are of a dingy yellow colour; the fur on the upper

surface is, for two-thirds of its length, of a blueish ash tipped with brown, giving it a changeable brown appearance. Under the throat and beneath, a dark fawn; the under surface of the tail, of a buff colour; extremity of the tail nearly black.

Of this species we have seen only the specimen from which this description was made. From a note of Professor JOHNSON, accompanying the specimen, we learn that it "was found on the high table-land on a branch of DRURY'S Run, a tributary of the west branch of the Susquehannah river."

*The following Species, described as belonging to our country, we have had no opportunity of examining.*

10. SOREX *parvus*. SAY. Small Shrew.

S. *parvus*. SAY in LONG'S Expedition, vol. 1., p. 163.—HARLAN'S Fauna, p. 28.—GODMAN'S Natural History, vol. 1., p. 78., plate 3.

This species has not been satisfactorily identified since its first discovery. It, however, agrees with a specimen obtained at BEHRING'S Straits, by Mr. COLLIE, surgeon of his Majesty's ship Blossom, as referred to by Dr. RICHARDSON, (Fauna Boreali-Americana, vol. 1., p. 8.) This is described as having a dark brownish gray colour above, and a gray tint beneath; measuring from the tip of the snout to the root of the tail two inches and four lines,—and its tail was one inch long. Having never had an opportunity of examining this species, we subjoin for the sake of convenient comparison, the description of SAY, in whose accuracy perfect reliance may be placed:

"Body above, brownish cinereous; beneath, cinereous; head elongated; eyes and ears concealed; whiskers long, the longest nearly attaining the back of the head; nose naked, emarginate; front teeth black, lateral ones piceous; feet whitish, five-toed; nails prominent, acute, white; tail short, subcylindric, of moderate thickness, slightly thicker in the middle, whitish beneath."

*Dimensions.*

| | |
|---|---|
| Length from the tip of the nose to the root of tail, | 2¼ in. |
| Length of tail, | ¾ |
| Length from upper teeth to the tip of the nose, | 3/16 |

This species was obtained at Engineer Cantonment on the Missouri; where it was caught in a pit-fall, set for a wolf, by Mr. TITIAN PEALE. GODMAN says (vol. 1., p. 79,) it may properly be considered as one of the smallest mammiferous animals belonging to this Continent.

In this conjecture he was mistaken, as other species, still less in size, have since been discovered in our country.

### 11. SOREX *palustris*.

RICHARDSON'S Fauna Boreali-Americana, vol. 1., p. 5.

This animal, which HEARNE informs us often takes up its abode in the beaver-houses of the fur

countries, is described as three inches six lines long in body; and its tail two inches seven lines; height of ear three lines; on the superior dorsal aspect it is black with a slight hoary appearance when turned to the light, a little paler beneath.

RICHARDSON describes the tail of this Shrew as longer than the body, but his measurements make it nearly an inch less.

## 12. SOREX *talpoides*.

GAPPER in Zoological Journal, No. xviii., p. 202., plate 8.

This species is described as four and a half inches long without the tail, but the figure measures only three and a half, or four and a half inches with the tail. It agrees with the dimensions of SOREX *brevicaudus* of SAY, but the descriptions of the two species differ materially from each other.

### 13. Sorex *personatus*.

Isod. St. Hilaire in Mém. du Mus., tom. 15., p. 122.

A small species; tail one-third of the total length, which is three inches. Sent from this country by Milbert. (1827.)

---

The S. *araneus*, S. *constrictus*, and S. *minutissimus*, which have by some authors been attributed to this country, are European species, and cannot be admitted into our Fauna, in the present state of our knowledge.

### *General Remarks.*

In having attempted to give a monograph of the most difficult genus among the Mammalia of our country, of which Major Le Conte a few years since said, that although many species existed, not one had been properly determined (see Translation of Cuvier, vol. 1., Catalogue,)

we have been fully aware of the danger of multiplying species on the one hand, and of confounding those that are distinct on the other. Many of the species here described are now, for the first time, brought to the view of naturalists. Those that were previously named, were so imperfectly described, that it was almost impossible for the unpractised naturalist to designate the species. We can scarcely hope, even after having used the utmost caution, and compared many specimens, that we have fully succeeded in establishing all the species which we have attempted to describe. We still entertain some doubts whether the S. *cinereus* may not yet prove to be the young of some other species. All the specimens we examined were so deficient in the number of teeth usually found in this Genus, that we have not been satisfied of our having, as yet, found the adult animal. The Carolina Shrew is the only one, in this vicinity, that resembles it, yet the smaller animal has invariably a longer tail than the larger species. In uniting the S. *Carolinensis* with the species existing in the middle States, we may possibly have blended two distinct species; the same may be said of the S. *Forsteri*, as existing in New Jersey and the far North West. We have, however, found no such decided marks of difference

as would warrant us in separating them. Future naturalists will, no doubt, be able to discover and correct some errors into which we have inadvertently fallen. But we still hope that the science will not suffer from this attempt, and that a commencement has here been made, which will be more successfully prosecuted by others. We have met with almost insuperable difficulties in describing the colours of this genus of animals. They vary so much in different lights, that scarcely two naturalists will be found to agree on the true colour of any one species. The number and arrangement of the teeth, in many species, do not seem to differ so widely as to enable us to separate closely allied species with certainty, by the dentition. In size, however, there does not appear to be much difference among individuals of the same species. The length of tail we have usually found a tolerably safe guide; and, above all, the shape and length of the ear, we have found the best criterion; for these we have never found to vary. In deciding between young and old animals, the number of teeth will, in general, aid us in the investigation. Whenever there is a material deficiency in these, there is reason to suppose that the animal has not arrived at full maturity. In examining the length of tail we

should always bear in mind, that the tails of young quadrupeds are always longer in proportion to their size, than in the adult; and that their tails do not increase in length in the same ratio with their bodies. We have observed, in the species of Mus and Arvicola, that whilst the body may increase in length, to double the size, the tail scarcely lengthens a fourth.

In deciding on those species that we have described, and which seem to approach each other very nearly in some particulars, the following observations may be of some importance. The S. *Dekayi*, may be distinguished from S. *brevicaudus* by its larger head, longer body, shorter tail, and different colour. The S. *cinereus* may be known from S. *Carolinensis*,* by its smaller feet and body, and by its lighter colour beneath. The S. *longirostris* may always be recognised by its ears protruding distinctly beyond the fur, it

* We received from Mr. Cooper three specimens, which we have, with some hesitation, referred to Sorex *Carolinensis*, agreeing with those in shape and colour; yet we remarked, that their bodies were about half an inch, and their tails one-third of an inch, longer than those of Carolina. Out of many specimens found here, we have never seen much difference in size, and their tails are usually less than three-fourths of an inch. On the other hand, all the New York specimens closely resembled each other, and were not only larger in size, but their tails were uniformly an inch in length.

being the only species yet found in our country possessing this peculiarity; the S. *Forsteri*, by its broad ears, concealed slightly beneath the fur; the S. *Cooperi*, by its very diminutive size, its peculiar colour, and by its being destitute of ears; the S. *parvus* and S. *Richardsonii*, by the difference in the ears and tails of the two species; and the S. *fimbripes*, by its broad, furry, turtle-like feet, and by its fawn colour beneath.

Several of our species, which we have had an opportunity of examining, exhale that kind of musky odour ascribed to the shrews of Europe. The glandular apparatus in which this odour is contained, appears to be more enlarged during the breeding season, than at other periods, and is more perceptible in the males than in the females. We observed a cat occcasionally bringing to her young brood the Carolina shrew, these readily fed on the young shrews, but rejected the old, probably on account of their offensive odour.

## ADDITIONAL NOTE ON THE GENUS LEPUS.

On further reflection, and on an examination of the 62d volume of the London Philosophical Transactions, which appears to contain the earliest account of the Northern Hare, I am induced to think that I have been led into an error in the synonymes of two of the species of LEPUS. Although I have not been able to consult the works of ERXLEBEIN and PALLAS, who first gave LEPUS *Americanus* and LEPUS *Hudsonius*, I am induced to follow RICHARDSON in attributing these synonymes to the Northern Hare, and the rule of priority, which must be rigidly adhered to, will in that case exclude the name of *Virginianus*.

The common Gray Rabbit of the United States (the American Hare of this article) will then remain without a specific name—although its habits and history have been blended with those of the former, by various writers. I would, therefore, propose for this species the name of LEPUS *sylvaticus*.

## *Description of a New Species of Woodpecker.*

*By* JAMES TRUDEAU, M. D.

Read June 27th, 1837.

PICUS *Audubonii.* AUDUBON'S Woodpecker.

Bill strong, rather long, slightly curved on the upper edge, beneath of a dull white; top of the head, occiput, back of the neck, upper part of the wings and rump, black. A few yellowish feathers on the head unite on each side with a whitish line passing under the eyes to the occiput. A band of purer white runs from the lower mandible and ends on the neck. On the back, a line of white and long feathers extends from the neck to the rump. Wings black crossed by seven white bands. Tail pointed, composed of ten feathers. The outer one pure white, the second and third variegated with black and white, the others deep black. Iris brown. Length, seven inches. Extent, thirteen and one-half inches. (Sex unknown.)

This species resembles the Hairy and Downy Woodpeckers in plumage, but is very distinct,

and is intermediate in size between them. It seems in fact to form a passage from the Hairy to the Downy Woodpecker.

Hunting in a wood 15 miles from New Orleans, on the 26th of last April, my attention was attracted by a very extraordinary note, and after some difficulty I succeeded in getting possession of the bird from which it proceeded. It was very wild, running on the trunks and limbs of trees with the agility peculiar to the family, always contriving to keep on the side of the trunk most distant from its pursuer. It was the species now described. I have frequently examined the spot in hopes of getting more; and although I have often heard its note, the bird has, in the very thick woods, eluded my pursuit. The sportsmen with whom I have spoken of it, suppose it to be a common species. It is probable that this curious bird, respecting which I have learned nothing farther, has escaped the observation of naturalists on account of its resemblance to the two species already named.

## *Comparative marks of the three species.*

| Picus *villosus.* | Picus *Auduboni.* | Picus *pubescens.* |
|---|---|---|
| *Length from the point of the bill to the end of the tail.* | | |
| Nine inches. | Seven inches and a half. | Six inches and a half. |
| *Extent.* | | |
| Fifteen inches. | Thirteen & a half inches. | Twelve inches. |
| *Length of the bill.* | | |
| One inch two lines. | One inch. | Seven lines. |
| *Length of the tarsus.* | | |
| One inch two lines. | Eight lines. | Six lines. |
| Head black with a red stripe. | Head yellowish, with no red stripe. | Head black with a red stripe. |
| Nine bars on the wing. | Seven bars. | Six bars. |
| The two exterior feathers of the tail white, the third black & white. | The exterior white, the second and third black and white. | The three exterior white crossed by four black spots. |
| *Claws.* | | |
| Black. | Horn colour. | Black. |

Note.—In a collection of very interesting birds, &c. just received by the Academy, from Dr. Jenkins, of Mississippi, is a specimen of this species. It differs from my individual by the total absence of yellow, which renders it probable that the Doctor's is either a female or a young bird. Another specimen, probably a male, exists in a collection of birds made by Mr. Nuttall in the vicinity of Cambridge, Massachusetts.

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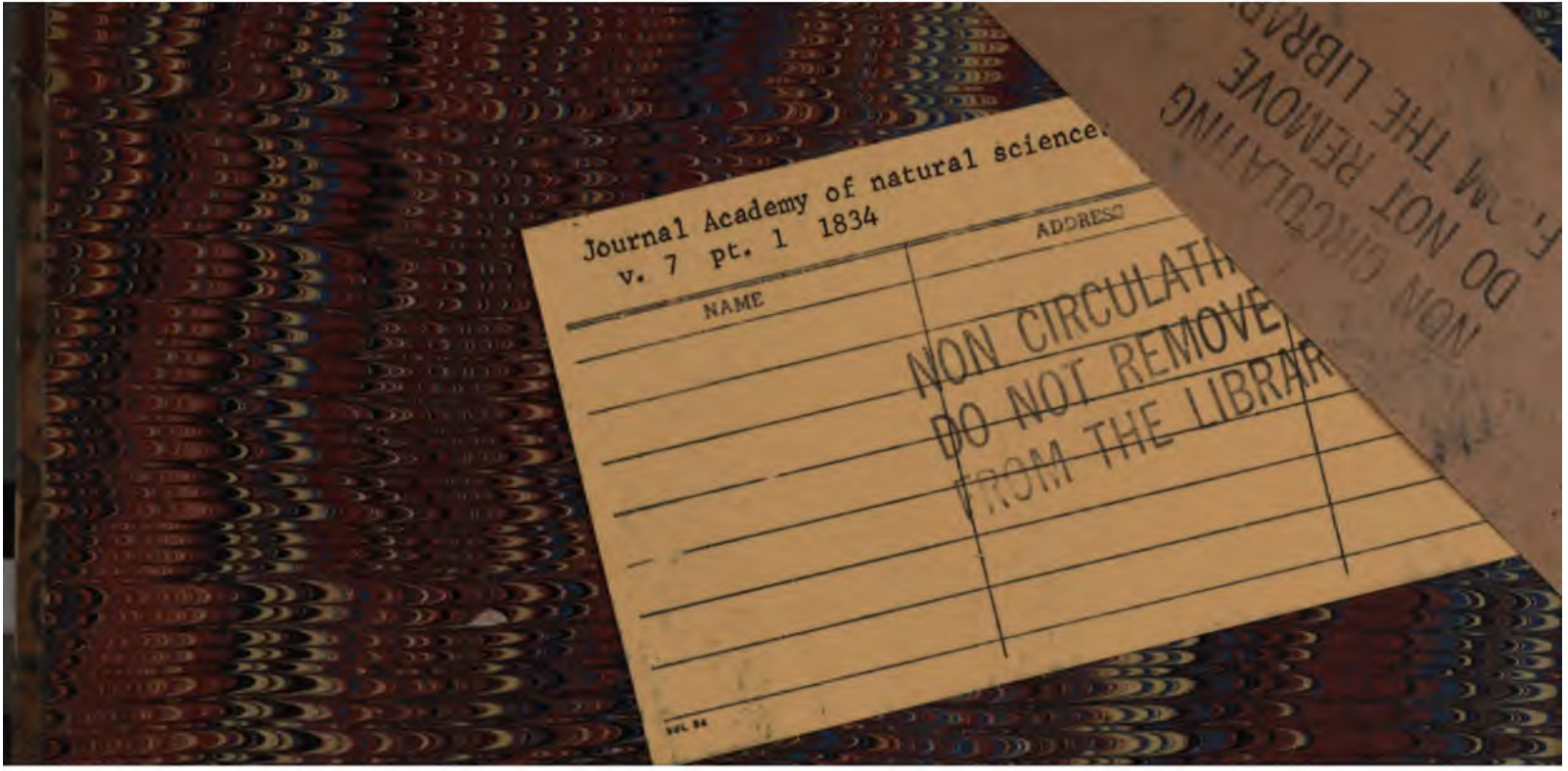
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